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BULLETIN 99. **JULY, 1893.**

MICHIGAN

AGRICULTURAL EXPERIMENT STATION

STATE AGRICULTURAL COLLEGE.

CHEMICAL DEPARTMENT.

MICHIGAN SOILS.

CHEMICAL ANALYSIS OF

1. Wheat Lands,
2. Soils of Peach Belt,
3. Potato District,
4. Jack-Pine Plains,
5. Celery Soils,
6. Ceneral Purpose Soils.

BY R. C. KEDZIE.

The Bulletins of this Station will be sent free to all newspapers in the State, and to such individuals int- l in farming as may request it. Address all applications to the Secretary, ultural College, Michigan.

MICHIGAN AGRICULTURAL EXPERIMENT STATION.

Postoffice Address, ... Agricultural College, Mich.
Railroad, Express and Telegraph Address, ... Lansing, Mich.

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SUB-STATIONS.

Grayling, Crawford County, 80 acres deeded; Dr. O. Palmer, Local Agent.
South Haven, Van Buren County, 10 acres rented; 5 acres deeded; Hon. T. T. Lyon, President State Horticultural Society, Local Agent.

THE SOILS OF MICHIGAN.

No state in the union has suffered more in reputation from false statements and ignorant misrepresentation than Michigan. At the time of its first settlement, to the popular apprehension the far-off and unknown Michigan was only, and would forever remain, the home of the wolf, the Indian and ague. By the white man it was uninhabited and uninhabitable. In a report made to a religious body in regard to the feasibility of establishing missionary stations in order to christianize this heathen wild, it was stated that the project was impracticable, "because only a narrow strip along the border of the territory was inhabitable, the interior being a vast and impenetrable swamp.".

In his address at the laying of the corner stone of the new capitol in 1872, Hon. W. A. Howard made the following extract from the report of the surveyor general of Ohio, bearing date November 30, 1815: "The country on the Indian boundary line, from the mouth of the great Auglaize river and running thence for about fifty miles is (with few exceptions) low, wet land, with a very thick growth of underbrush, intermixed with very bad marshes, but generally very heavily timbered with beech, cottonwood, oak, etc.; thence continuing north and extending from the Indian boundary eastward, the number and extent of the swamps increase, with the addition of numbers of lakes from twenty chains to two or three miles across. Many of the lakes have extensive marshes adjoining their margins, sometimes thickly covered with a species of pine called tamarack, and other places covered with a coarse, high grass and uniformly covered from six inches to three feet (and more at times) with water. The margins of these lakes are not the only places where swamps are found, for they are interspersed throughout the whole country, and filled with water, as above stated, and varying in extent. The intermediate space between the swamps and lakes, which is probably near one-half of the country, is with a very few exceptions a poor, barren, sandy land, on which scarcely any vegetation grows, except very small scrubby oaks. In many places that part which may be called dry land is composed of little short sand hills, forming a kind of deep basins, the bottoms of many of which are composed of marsh, similar to the above described. The streams are generally narrow and very deep, compared with their width, the shores and bottoms of which are (with a very few exceptions) swampy beyond description; and it is with the utmost difficulty that a place can be found over which horses can be conveyed.

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"A circumstance peculiar to that country is exhibited in many of the marshes by their being thinly covered with a sward of grass, by walking on which evinced the existence of water or a very thin mud immediately under their covering, which sinks from six to eighteen inches from the pressure of the foot at every step and at the same time rising before and behind the person passing over. The margins of many of the lakes and streams are in a simular situation and in many places literally afloat. On approaching the eastern part of the military lands towards the private claims on the straits and lake, the country does not contain so many swamps and lakes, but the extreme sterility and barrenness of the soil continues the same. Taking the country altogether, so far as has been explored and to all appearances, together with the information received concerning the balance, it is so bad there would not be more than one acre out of one hundred, if there would be one out of one thousand that would, in any case, admit of cultivation."

From the number of persons who have continued to decry Michigan in whole or in part it would seem that the surveyor general of Ohio had a large family. But as settlers poured into the new territory they were surprised and delighted to find, instead of impassable bogs and sterile sand-hills, a region of wonderful beauty and fertility. Thus one county after another was rescued from the supposed dominion of chimeras dire, and pronounced to be the best farm lands on which the sun shines. But who shall say how many persons have been deterred by such ignorant and reckless assertions from making their home in the best state in our union? Sin drove the first pair from the primal Eden, but ignorance has barred out thousands of their children from many an earthly paradise.

GEOGRAPHICAL POSITION.

When we cast our eyes upon the map of our country we are struck with the unique position which our peninsula occupies in comparison with other lands in the same latitude and mark how Nature clasps with her protecting arm of *water* the "beautiful peninsula" and pours out the vast "unsalted seas" a rampart against the cold. Its geographical position and surroundings point it out as eminently fitted for productive industry, while its easily available water carriage will save it from the blighting influence of monopoly in transportation. The watered-stock of railways find more than a match in the water ways of our system of lakes, drowning out monopoly of transportation. Michigan is planted on the highway of nations—the highway of commerce that must last "as long as grass grows and water runs." Such a region must occupy a prominent position in the world's industries and commerce, unless these exceptional advantages are offset by unusual disabilities.

LUMBERING VS. FARMING.

The vast wealth of Michigan in lumber has so filled the public eye that it could not see the greater wealth of its soil. Men seemed to assume that the better it was for lumber the worse it must be for agriculture—as if a soil that could sustain such a wonderful forest growth must be incapable of growing anything but wood. As a consequence men seeking for new lands to make new homes have turned their back on rich soils, well watered lands, ready markets, available transportation, schools and churches,

security and civilization to seek in the far west their resting place amid the alternate parching heat and deadly cold, and the wild disorder, discomfort and insecurity of border life. They reached for sunset and grasped a shadow. The great mass of these restless wanderers have rejected Michigan for a home because they were ignorant of this region—of its soil, productions, capabilities for cultivation, and it adaptedness to make desirable homes.

ANALYSIS OF MICHIGAN SOILS.

Desirous of obtaining reliable data for estimating the value of our soils, I sent out a circular fifteen years ago asking for representative soils from all the counties of the State, for chemical analysis, calling for soils that would be fairly representative of the locality, and not soils of exceptional quality. In response to this circular, thirty-one samples of soil were received, analyzed and the results of analysis published in the report of the State Board of Agriculture for 1878. Some attention was also directed to the physical properties of the soil, especially as related to water.

When chemistry was first applied to agriculture, it was supposed that the greatest benefit which chemistry could confer upon agriculture was to be derived from the analysis of the soil. The striking results which Sir Humphrey Davy obtained by analysis of a soil, barren from excess of the sulphate of iron, and the removal of the barrenness by adding lime to decompose the sulphate, confirmed the impression of the signal benefit to be derived from a chemical analysis of the soil. It was supposed that the fertility of any soil, the kind of crop it was fitted to raise, or the material which must be added to the soil to develop its greatest productiveness, were each and all to be determined simply by a chemical analysis of the soil. These extravagant expectations have not been realized. It was found that chemical analysis will not always distinguish between a fruitful and an unfruitful soil. A soil may be unproductive for physical reasons, though it may still contain all the chemical elements of fertility. The complete failure of Liebig's mineral theory of manures when put to the test of experience rang the knell of mere soil analysis.

But if chemical analysis failed when so much was demanded of it, we are not to go to the other extreme and conclude that because it is not good for so many things it is good for nothing. Chemical anlysis of the soil is of value in determining whether a soil is capable of fertility or the contrary; also in determining the measure of its possible fertility. There are certain ash elements which are absolutely necessary for plant growth, in the absence of any one of which vegetable growth is impossible; if the supply is relatively limited, plant growth will be limited correspondingly. If all the ash elements are present in sufficient amount and in available form, such soil is capable of fertility. Hence, chemical analysis of a soil is of importance in determiniug possibility of fertility and of the relative fertility which may be secured under favorable conditions.

CLASSIFICATION OF MICHIGAN SOILS.

No minute and technical classification of soils is attempted. The soils are classed rather for their agricultural uses than their chemical composition; the geographical position and climatic conditions in some cases affording a basis for classifying, e. g., the peach lands.

A word of explanation in regard to the meaning of the tables of analysis may be proper. To any one not familiar with agricultural chemistry, such tables will appear very dry and uninteresting, or even unintelligible. In these tables sand and silicates, alumina and oxide of iron make much the largest part of most soils. Everyone is familiar with sand; alumina is the basis of clay, and oxide of iron gives the brownish color to most soils. The great bulk of nearly all soils is made up of sand, clay and oxide of iron. Alumina is never found in the ash of cultivated plants; a certain amount of silica and oxide of iron is found in the ash of all plants; but the great mass of these materials as found in the soil is in large excess of the demands of the plant, and is of no worth in the chemistry of plant life; they are the mechanical agents of the soil, and are of worth mainly from their relations to temperature, moisture and the mechanical support of plants; their chief office in the soil is physical and not chemical, rendering the soil light or heavy, porous or retentive. The organic matter of the soil, besides furnishing a supply of combined nitrogen, is valuable for its physical relations to temperature, moisture and porosity of soils, and because it is an active agent in securing chemical changes in the soil, bringing the reserve elements of plant growth into active form.

The numbers attached to the following analyses refer to sample bottles of soils placed in the exhibit of the Experiment Station of the Michigan Agricultural College in the World's Fair, and to coresponding sample bottles in the Michigan State Exhibit in Agricultural Hall and one other set of such bottles at the Michigan Agricultural College. By referring to these sample bottles the reader can find the soils as well as learn their chemical composition.

I. *Wheat Lands. Nos. 1 to 9.*

A large part of the soils of Michigan are well fitted for the growth of winter wheat, and it might seem invidious to select any portion as wheat lands in particular, but the four southern tiers of counties are so specially adapted to this crop that they may be called the wheat belt.

No. 1.—River Rasin Bottoms, Deerfield, Lenawee, County.

Selected by Geo. H. Kedzie.
Forest Growth: Ash, Baswood, Hickory, Black Walnut, Oak, etc.
Soil cultivated forty years, without manure.

Sand and silicates	58.17
Alumina	6.48
Oxide of iron	7.62
Lime	1.98
Magnesia	1.43
Potash	1.84
Soda	1.20
Sulphuric acid	.32
Phosphoric acid	.40
Organic matter containing .42 Nitrogen	10.97
Water	9.45

Capillary capacity for water, 65.60

No. 2.—River Rasin Bottoms, Deerfield, Lenawee Co.

Selected by Geo H. Kedzie.
Virgin soil.
Timber: Ash, Basswood, Black Walnut, Oak, etc.

Sand and silicates	62.42
Alumina	10.64
Oxide of iron	3.46
Lime	2.10
Magnesia	1.59
Potash	2.05
Soda	1.19
Sulphuric acid	.24
Phosphoric acid	.41
Organic matter containing .37 Nitrogen	9.39
Water	6.08

Capillary capacity for water, 61.20

No. 3.—Burr Oak Wheat Lands, Saline, Washtenaw county.

Selected by J. S. Wood.
Timber: Burr Oak.

Sand and silicates	81.00
Alumina	5.23
Oxide of iron	4.66
Lime	1.28
Magnesia	.86
Potash	1.18
Soda	.19
Sulphuric acid	.42
Phosphoric acid	.40
Organic matter containing .11 nitrogen	2.98
Water	1.72

Capillary capacity for water, 36.30.

No. 4.—Prairie Soil, Volinia, Cass Co.

Selected by M. J. Gard.
Soil has been pastured but never cultivated.

Sand and silicates	63.77
Alumina	3.72
Oxide of iron	5.11
Lime	2.02
Magnesia	.66
Potash	1.18
Soda	.56
Sulphuric acid	.13
Phosphoric acid	.44
Organic matter containing .23 nitrogen	12.30
Water	10.19

Capillary capacity for water, 73.20.

No. 5.—Prairie Soil, Volinia, Cass Co.

Selected by M. J. Gard.
Soil has been cultivated for thirty years, has been plastered.

Sand and silicates	75.74
Alumina	4.20
Oxide of iron	5.46
Lime	1.38
Magnesia	.56
Potash	1.10
Soda	.43
Sulphuric acid	.18
Phosphoric acid	.33
Organic matter containing .21 nitrogen	7.50
Water	3.10

Capillary capacity for water, 50.55.

No. 6.—Bottom lands of Tittabawassee.

Selected by Geo. F. Ball.
Timber: Beech, maple, oak and basswood.

Sand and silicates	67.20
Alumina	6.31
Oxide of iron	7.91
Lime	1.64
Magnesia	1.23
Potash	1.85
Soda	1.15
Sulphuric acid	.30
Phosphoric acid	.49
Organic matter containing .22 nitrogen	7.48
Water	4.00

Capillary capacity for water, 51.40.

No. 7.—Garden Soil, Agricultural College.

Shlected by R. C. Kedzie.
Timber: Oak, beech, maple, elm, cherry and sassafras.

Sand and silicates	85 37
Alumina	4.53
Oxide of iron	1.81
Lime	1.22
Magnesia	.59
Potash	.85
Soda	.37
Sulphuric acid	.23
Phosphoric acid	.30
Organic matter containing .16 nitrogen	3.14
Water	1.55

Capillary capacity for water, 39.60.

No. 8.—Clay Soil from Vineyard Agricultural College.

Selected by R. C. Kedzie.
Timber: Oak, maple, beech and elm.

Sand and silicates	65.48
Alumina	15.60
Oxide of iron	6.40
Lime	1.28
Magnesia	.89
Potash	2.12
Soda	1.16
Sulphuric acid	.25
Phosphoric acid	.41
Organic matter containing .11 nitrogen	4.10
Water	2.28

Capillary capacity for water, 59.15.

No. 9.—Loamy soil from field No. 8, Agricultural College.

Selected by R. C. Kedzie.
Timber: Oak, beech and maple,

Sand and silicates	74.65
Alumina	9.66
Oxide of iron	4.18
Lime	1.46
Magnesia	.43
Potash	1.97
Soda	1.13
Sulphuric acid	.26
Phosphoric acid	.31
Organic matter containing .12 nitrogen	4.66
Water	1.25

Capillary capacity for water, 43.50.

II. *Peach Belt.*

The conditions that determine the successful cultivation of the peach in our State are climatic to a large extent. Yet the peach thrives best, and produces fruit of finest quality on light, porous soils which are found in abundance along the eastern shore of Lake Michigan. Yet fruit of good quality is produced on some of the heavy clay lands found in this belt.

No. 10.—Peach belt soil, South Haven VanBuren Co.

Selected by A. S. Dyckman.
Timber: Hemlock.

Sand and Silicates	87.23
Alumina	2.87
Oxide of Iron	1.52
Lime	.51
Magnesia	.46
Potash	.83
Soda	.34
Sulphuric Acid	.20
Phosphoric Acid	.13
Organic matter containing .07 nitrogen	3.41
Water	2.23

Capillary capacity for water, 44.70.

No. 11.—Soil from Chase, Lake Co.

Selected by J. Brown.
Timber: Maple, Elm, Hemlock, Basswood, etc.

Sand and Silicates	87.32
Alumina	3.22
Oxide of Iron	2.10
Lime	.62
Magnesia	.28
Potash	.90
Soda	.63
Sulphuric Acid	.10
Phosphoric Acaid	.23
Organic matter containing .12 Nitrogen	3.78
Water	.55

Capillary capacity for water, 45.55.

No. 12.—Soil from Eden, Mason Co.

Selected by C. E. Resseguie.
Timber: Hemlock, intermixed with Hard Wood.

Sand and Silicates	92.43
Alumina	2.99
Oxide of Iron	1.23
Lime	.66
Magnesia	.12
Potash	.65
Soda	.23
Sulphuric Acid	.10
Phosphoric Acid	.22
Organic matter containing .03 Nitrogen	.87
Water	.27

Capillary capacity for water, 32.40.

No. 13.—Sandy Loam, Eden, Mason Co.

Selected by C. E. Resseguie.
Timber: Hardwood, mixed with Hemlock.

Sand and Silicates	75.27
Alumina	6.93
Oxide of Iron	6.10
Lime	1.00
Magnesia	.89
Potash	2.10
Soda	.90
Sulphuric Acid	.27
Phosphoric Acid	.30
Organic matter containing .09 Nitrogen	3.30
Water	2.92

Capillary capacity for water, 42.85.

No. 14.—Soil From Evart, Osceola Co.

Selected by F. York.
Timber: Hardwood, mixed with Pine and Hemlock.

Sand and silicates	83.80
Alumina	5.10
Oxide of iron	3.24
Lime	.80
Magnesia	.64
Potash	1.19
Soda	.52
Sulphuric acid	.12
Phosphoric acid	.29
Organic matter containing .07 Nitrogen	3.06
Water	1.24

Capillary capacity for water, 45.80

No. 15.—Pine Land, Colfa x, Mecosta Co

Selected by Fitch Phelps.
Timber: Heavy Pine Forest.

Sand and Silicates	75.54
Alumina	10.62
Oxide of iron	3.80
Lime	.94
Magnesia	.48
Potash	1.96
Soda	1.25
Sulphuric acid	.26
Phosphoric acid	.44
Organic matter csntaining .12 Nitrogen	2.97
Water	1.44

Capillary capacity for water, 45.40

No. 16.—Hardwood Lands, Big Rapids, Mecosta Co.

Selected by G. W. Warren.
Timber: Beech, Maple, Basswood.

Sand and silicates	76.00
Alumina	10.00
Oxide of iron	3.41
Lime	1.14
Magnesia	.49
Potash	1.80
Soda	1.16
Sulphuric acid	.24
Phosphoric acid	.33
Organic matter containing .10 Nitrogen	3.18
Water	1.90

Capillary capacity for water, 43.80.

No. 17.—Hardwood soil, Sherman, Wexford Co.

Selected by H. D. Griswold.
Timber: Maple, Rock-elm, Beech, Basswood and a little Hemlock.

Sand and silicates	86.74
Alumina	4.32
Oxide of iron	2.10
Lime	.65
Magnesia	.24
Potash	.83
Soda	.34
Sulphuric acid	.14
Phosphoric acid	.15
Organic matter containing .11 Nitrogen	3.26
Water	.86

Capillary capacity for water, 44.00.

No. 18.—Soil from Lake City, Missaukee Co.

Selected by L. A. Barker.
Timber: Beech, Maple, Elm and some Pine.

Sand and silicates	69.39
Alumina	8.35
Oxide of iron	5.80
Lime	1.15
Magnesia	.98
Potash	1.95
Soda	1.15
Sulphuric acid	.25
Phosphoric acid	.28
Organic matter, containing .11 nitrogen	4.73
Water	5.38

Capillary capacity for water, 39.10.

III. *The Potato District.*

Numbers 19 to 21 embrace several counties in the Traverse Bay region, where the soil is a sandy loam, rich in lime and potash. The fall of snow, caused by proximity to the lake, often comes before the ground is frozen,

and root crops may be left in the ground all winter without injury. The porous nature of the soil, the abundance of lime and potash, and the climatic conditions all contribute to the production of potatoes of superior quality.

No. 19.—Potato Soil, Grand Traverse.

Selected by C. F. Davis,
Timber: Beech, Maple, Ash and Rock Elm.

Sand and silicates	88.65
Alumina	2.95
Oxide of iron	2.60
Lime	1.37
Magnesia	.41
Potash	.89
Soda	.32
Sulphuric acid	.14
Phosphoric acid	.13
Organic matter containing .04 nitrogen	2.05
Water	.49

Capillary capacity for water, 40.20.

No. 20.—Potato Soil, Benzonia, Benzie Co.

Selected by C. L. Northrop.
Timber: Beech, Maple, Ash, Elm, Cherry, etc.

Sand and silicates	90.08
Alumina	2.86
Oxide of iron	1.50
Lime	.55
Magnesia	.27
Potash	1.10
Soda	.45
Sulphuric acid	.18
Phosphoric acid	.21
Organic matter containing .07 nitrogen	2.45
Water	.35

Capillary capacity for water, 39.30.

No. 21.—Potato Soil, Elk Rapids, Antrim Co.

Selected by Geo. E. Steele.
Timber: Maple, Basswood, Elm, Beech and some Hemlock.

Sand and silicates	84.68
Alumina	4.82
Oxide of iron	3.20
Lime	.95
Magnesia	.36
Potash	.98
Soda	.40
Sulphuric acid	.16
Phosphoric acid	.18
Organic matter containing .08 nitrogen	3.14
Water	.65

Capillary capacity for water, 52.10.

IV. *Jack-Pine Plains. Nos. 22 to 25.*

In the northern central portion of the lower peninsula is a large tract of light sandy lands which have been called jack-pine lands, the barrens, the plains, etc. It is a light, sandy soil, of a brownish color from the presence of oxide of iron, very porous, and little retentive power for water. The principal timber is *pinus banksiana* (jack-pine), scarlet oak, with scattering trees of Norway pine and white pine. The subsoil seldom has any hard pan, and the water line in the soil is usually from fifteen to thirty feet below the surface of the soil.

The annual fires which sweep over these plains burn up the yearly accumulation of vegetable matter, and the soil contains very little humus. The small lakes have an abundant deposit of marl of good quality.

Some experiments have been made to ascertain the possibility of the use of these lands for agricultural or grazing purposes, on the experimental farm at Grayling, Crawford county. Three specimens of soil from this experimental farm are offered for inspection and one of marl from a lake near by. By comparing No. 22, the soil in its natural condition, only fenced

in and protected from fire for three years, with Nos. 23 and 24 which have been culitvated and enriched by plowing under the green crops raised without manure (green manuring,) the changes in the physical appearance and in chemical composition can be observed. The north field (No. 23) has raised successive crops of spurry, vetch and peas, which have been plowed under. The south field (No. 24) has raised successive crops of spurry, peas and red clover, all plowed under.

No. 22.—Virgin soil from the experimental farm at Grayling.

Sand and Silicates	94.97
Alumina	1.03
Oxide of iron	.86
Lime	.20
Magnesia	.12
Potash	.20
Soda	.90
Sulphuric acid	.06
Phosphoric acid	.05
Organic matter containing .02 Nitrogen	1.61
Water	.23

No. 23.—North field of the experimental farm at Grayling.

Sand and silicates	94.30
Alumina	.61
Oxide of iron	1.17
Lime	.24
Magnesia	.17
Potash	.33
Soda	.58
Sulphuric acid	.05
Phosphoric acid	.04
Organic matter containing .05 Nitrogen	2.50
Water	.20

No. 24.—South field of the experimental farm at Grayling.

Sand and silicates	95.02
Alumina	.49
Oxide of iron	.78
Lime	.32
Magnesia	.15
Potash	.30
Soda	.62
Sulphuric acid	.05
Phosphoric acid	.01
Organic matter containing .04 nitrogen	2.25
Water	.21

No. 25.—Marl from the lake, Grayling.

Sand and silicates	1.90
Alumina	.14
Oxide of iron	.10
Lime	45.16
Magnesia	.32
Potash	.37
Soda	2.65
Sulphuric acid	.56
Phosphoric acid	.01
Carbonic acid	43.10
Organic matter containing .20 nitrogen	5.69
Water	.64

V. *Soils for special crops: Muck lands adapted to the growth of celery, cranberries, peppermint, etc. Nos. 26 to 28.*

Of all our kinds of soil, swamp muck has been most conspicuously held up to public opprobium. Nothing good was said about it; nothing too bad could be said against it. Yet for certain kinds of crops it was found the best land in the world, and the fame of Michigan celery has gone into every state.

No one who has tasted Kalamazoo celery will forget its fine flavor, which has established its reputation far and wide. Many will look to the composition of the soil on which it is grown as the typical one for raising celery.

No. 26.—Michigan celery soils: Kalamazoo celery soil from Kalamazoo, Michigan.

Selected by J. Dunkley.

Sand and silicates	19.16
Alumina	1.40
Oxide of iron	3.94
Lime	6.09
Magnesia	.81
Potash	.34
Soda	.38
Sulphuric acid	1.31
Phosphoric acid	.88
Carbonic acid	1.95
Organic matter containing 2.53 nitrogen	63.76
Water	6.51

Grand Haven has also become a center for the production of this delicious and appetizing plant. The extensive deposits of muck near the mouth of Grand river afford a large field for this plant.

No. 27.—Michigan celery soils: Grand Haven celery soil from Grand Haven, Mich.

Selected by George Hancock.

Sand and silicates	24.09
Alumina	1.71
Oxide of iron	3.52
Lime	5.02
Magnesia	.62
Potash	.20
Soda	.33
Sulphuric acid	1.04
Phosphoric acid	.69
Carbonic acid	1.05
Organic matter containing 2.32 nitrogen	61.73
Water	10.85

But celery soils are not limited to the lower peninsula. A choice specimen of celery muck was received from the Newberry Celery & Improvement Co., at Newberry, Luce county. Superintendent H. L. Harris writes: "On this soil we have produced the finest celery grown in the State. The celery grown here has a fine nutty flavor unknown to the celery grown in the southern part of the State. The soil is from sixteen feet to unknown depth, and there are thousands of acres of the same character of soil in our vicinity. We would also say that during the eight years we have been growing celery here we have not had a failure of crop."

No. 28.—Michigan celery soils: Newberry celery soil from Newberry, Luce Co., Mich.

Selected by H. L. Harris, superintendent of the Newberry Celery and Improvement Company.

Sand and silicates	24.56
Alumina	2.21
Oxide of iron	1.30
Lime	4.18
Magnesia	.75
Potash	.42
Soda	.40
Sulphuric acid	.67
Phosphoric acid	.46
Carbonic acid	1.10
Organic matter containing 1.75 nitrogen	63.75
Water	7.31

A comparison of these celery soils brings out the fact that, except in the amount of sand and silicates, the composition shows a close similarity. The common supposition that oxide of iron is especially injurious in celery soils is not borne out by these analyses. Sulphate of iron is very injurious, and when more than one per cent is present no valuable crop will grow. A specimen of muck was sent here from Decatur which was barren from this cause.

PROPERTIES OF GOOD MUCK.

In the moist condition, all these kinds of muck have a deep brown-black color, the blacker the better; they are friable, easily breaking between the fingers, and are free from coarse, fibrous material; they have a pleasant earthy smell but no acid odor, and are entirely free from acid reaction. When moist muck of good quality is pressed against blue litmus paper so as to wet the paper, the blue color remains and no reddening takes place. Any muck that will redden blue litmus is unfit for cultivation while this acid condition remains. Sour muck is sorry material for cultivation. All the specimens of infertile muck that have been sent here for analysis—muck that would not grow weeds even—have been of this sour class and would turn blue litmus paper red very rapidly. By draining and weathering such soils by exposing to the action of frost, and especially by the application of lime, wood ashes, even leached ashes, the acid condition can be removed and these barren soils made to produce abundant crops of a certain class.

OTHER MUCK CROPS.

Celery is not the only plant that can be profitably raised on muck lands. Cranberry farms have been made on the mucky soil near St. Joseph and cranberries of superior quality produced. But success with this crop requires a soil free from acid; patches of sterile muck are often found in parts of cranberry fields, but in every instance the muck was sour.

Another crop distinctive of Michigan cultivation is the peppermint. The center of peppermint farming and distilling the oil seems to be in St. Joseph county. A request was made for a specimen of the muck that produced such large crops of the mint but none came. Another letter was sent which brought the following reply: "Yours of March 11th received. Your first communication was referred to ——— ———, of this town, who is the largest mint raiser in the State, and who promised me he would forward the soil desired, but I saw him this morning and he said the ground was so frozen that he could not get it without being to greater expense than he wished to incur. The facts are that he does not want published to the world the benefits of reclaiming marsh land, for that is all there is in it. Any marsh land that can be drained so that it can be worked and still hold enough moisture to carry the crop through is good enough mint soil. * * * I could go twenty rods from my store and get marsh soil and send you but it would not be essentially different from what you could get on the Agricultural farm."

My modest friend, the mint grower, had "oil in his vessel," but was unwilling to "let his light shine before men." However, a college student brought a specimen of the mint muck, but too late for analysis and mount-

ing to exhibit at the World's Fair. It does not differ in appearance and properties from the Kalamazoo celery muck, No. 26.

VI. *General Purpose Soils. Nos. 29 to 38.*

This embraces a number of soils found in the central and northern counties of the State, which are of too miscellaneous a character to be placed in a more restricted classification. They are inserted to round out the list of Michigan soils that have been analyzed at this college.

No. 29.—Gilmore, Isabella Co.

Selected by P. H. Robins.
Timber: Hardwood.

Sand and silicates	88.13
Alumina	3.77
Oxide of iron	2.40
Lime	.87
Magnesia	.27
Potash	.86
Soda	.37
Sulphuric acid	.16
Phosphoric acid	.19
Organic matter containing .08 nitrogen	2.35
Water	.52

Capillary capacity for water, 49.60.

No. 30.—Midland, Midland Co.

Selected by Gee. F. Ball.
Timber: Beech, maple, oak and basswood.

Sand and silicates	67.20
Alumina	6.31
Oxide of iron	7.91
Lime	1.64
Magnesia	1.23
Potash	1.85
Soda	1.15
Sulphuric acid	.30
Phosphoric acid	.49
Organic matter containing .22 nitrogen	5.30
Water	2.10

Capillary capacity for water, 51.15.

No. 31.—Sheridan, Clare Co.

Selected by J. C. Rockafellow.
Timber: Pine, hemloch, birch and maple.

Sand and Silicates	93.31
Alumina	2.03
Oxide of iron	1.40
Lime	.36
Magnesia	.16
Potash	.54
Soda	.26
Sulphuric acid	.08
Phosphoric acid	.15
Organic matter containing .03 Nitrogen	1.34
Water	.37

Capillary capacity for water, 43.10.

No. 32.—Grant, Clare Co.

Selected by J. C. Rockafellow.
Timber: Maple, beech, basswood, ash, oak, etc.

Sand and silicates	71.45
Alumina	6.50
Oxide of iron	7.18
Lime	.99
Magnesia	.73
Potash	1.90
Soda	1.20
Sulphuric acid	.19
Phosphoric acid	.36
Organic matter containing .16 Nitrogen	5.90
Water	3.70

Capillary capacity for water, 44.90.

No. 33.—Webber, Lake Co.

Selected by George W. Townsend. "The Plains."

Sand and Silicates	92.48
Alumina	2.22
Oxide of iron	1.59
Lime	.35
Magnesia	.30
Potash	.73
Soda	.32
Sulphuric acid	.06
Phosphoric acid	.14
Organic matter containing .04 Nitrogen	1.22
Water	.40

Capillary capacity for water, 35.30.

No. 34.—St. Louis, Gratiot Co.

Selected by S. S. Hastings.
Timber: Pine, Beech, Soft Maple, Oak and Sassafras.

Sand and silicates	88.54
Alumina	3.11
Oxide of iron	2.15
Lime	.68
Magnesia	.30
Potash	.92
Soda	.26
Sulphuric acid	.15
Phosphoric acid	.14
Organic matter containing .06 Nitrogen	2.82
Water	.41

Capillary capacity for water, 38.40.

No. 35.—Bay City, Bay Co.

Selected by Judge Marston.
Timber: Not stated.

Sand and silicates	82.24
Alumina	4.60
Oxide of iron	2.42
Lime	1.18
Magnesia	.46
Potash	1.18
Soda	.54
Sulphric acid	.20
Phosphoric acid	.38
Organic matter containing .17 nitrogen	5.57
Water	.25

Capillary capacity for water, 47.30.

No. 36.—Greenville, Montcalm Co.

Timber: Not stated.

Sand and silicates	85.40
Alumina	4.50
Oxide of iron	2.80
Lime	.82
Magnesia	.31
Potash	1.13
Soda	.45
Sulphuric acid	.21
Phosphoric acid	.20
Organic matter containing .10 nitrogen	2.75
Water	1.43

Capillary capacity for water, 37.80.

No. 37.—Gaylord, Otsego Co.

Selected by S. H. Crowl.
Timber: Maple, Beech, Hemlock, Basswood, etc.

Sand and silicates	91.92
Alumina	2.93
Oxide of iron	.90
Lime	.40
Magnesia	.13
Potash	.61
Soda	.28
Sulphuric acid	.10
Phosphoric acid	.14
Organic matter containing .07 nitrogen	2.20
Water	.39

Capillary capacity for water. 39.60.

No. 38.—Tawas, Iosco Co.

Selected by J. A. F. Scheffler.
Timber: Hemlock, Pine, Beech and Maple.

Sand and silicates	80.06
Alumina	7.15
Oxide of iron	3.53
Lime	.93
Magnesia	.36
Potash	1.10
Soda	.38
Sulphuric acid	.19
Phosphoric acid	.16
Organic matter containing .09 nitrogen	4.59
Water	.82

Capillary capacity for water, 63.80.

R. C. KEDZIE,
Chemist of Experiment Station.

AGRICULTURAL COLLEGE, MICH.,
July 2, 1893.

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MICHIGAN

AGRICULTURAL EXPERIMENT STATION

STATE AGRICULTURAL COLLEGE

HORTICULTURAL DEPARTMENT.

EIGHTY NEW STRAWBERRIES

BY L. R. TAFT and H. P. GLADDEN

The Bulletins of this Station will be sent free to all newspapers in the State, and to such individuals interested in farming as may request it. Address all applications to the Secretary, Agricultural College, Michigan.

MICHIGAN AGRICULTURAL EXPERIMENT STATION.

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Grayling, Crawford County, 80 acres deeded; Dr. O. Palmer, Local Agent.
South Haven, Van Buren County, 10 acres rented; 5 acres deeded; Hon. T. T. Lyon, President State Horticultural Society, Local Agent.

EIGHTY NEW STRAWBERRIES.

For several years we have given considerable attention to the testing of varieties, both of fruits and vegetables, and we have about one hundred and fifty varieties of strawberries in our test plots, besides a duplicate collection at the South Haven sub-station.

We have had under trial, since the spring of 1892, some eighty new varieties, many of which were received from the originators for trial previous to dessemination and others were obtained from the introducers; very few of them have as yet been generally introduced.

When we could obtain them, twenty-five plants of a variety were grown in narrow matted rows set three and one-half by one and one-half feet. They received clean cultivation and were mulched during the winter. The soil upon which they were grown was a sandy loam with a slight admixture of clay, well enriched with stable manure. The plants in most cases made a satisfactory growth, and seemed quite free from disease until the crop began to ripen, when several varieties were attacked and, as noted below, the crop was greatly shortened.

In order that the originators and introducers may be informed of the behavior of their varieties in this section, and that the public may have information to guide them in the selection of varieties, the results of this season's trial are given in this preliminary bulletin. Later on we shall publish our regular strawberry bulletin and the report of the year's work at South Haven.

The letters after the names of the varieties indicate the sex of the plants "B" standing for bi-sexual, or perfect flowering, and "P" for pistillate.

Accomack. B.—Plants from Slaymaker & Son, Dover, Delaware. Plants of rather weak growth; leaf-stalk medium to long; leaflets, size, medium to large; form, irregular ovate; teeth, large; color, medium to light green. Blossomed full. Ripe, June 21. Plants bore fair amount of fruit for strength of plant. Fruit—size, medium; form, long conical; color, dark crimson; quality 9, firmness 7. Plants lack productiveness and vigor of growth. Considerable rust.

Alabama. B.—Plants from Slaymaker & Son: Plants of rather weak growth; leaf-stalk, long, slender; leaflets small to medium size, narrow ovate form; teeth, small, sharp; color, medium green. Blossomed full but did not set much fruit. Crop at best June 26. Fruit—size, medium; form, round conical; color, dark crimson; productiveness 5, quality 9, firmness 9.5. Plant lacks productiveness and vigor of growth. Considerable rust. Probably of no value.

Afton. P.—Plants from C. W. Graham, Afton, N. Y. Plants of medium strong growth; leaf-stalk, long, slender; leaflets—medium size, narrow ovate form; teeth medium size, sharp; color, light green; texture, tough. Blossomed full and set a large amount of fruit. First ripe June 21. Crop at best June 24–26. Fruit, medium to large in size; form, round conical with short neck; color, very dark crimson; calyx persistent but berry picks easily; flesh dark; productiveness 9.5, quality 9, firmness 8.5.

Fruit of handsome appearance. One of the most promising sorts at the first of the season. The crop soon fell off rapidly. The plants rusted but little, but weakened in growth and did not mature the last fruits. Regard it as well worthy of further trial.

Beauty. B.—Plants from J. H. Haynes, Delphi, Ind. Plants medium strong in growth, leaf-stalk medium length, slender; leaflets medium size, round or ovate; teeth usually large, round; dark green color; thick in texture. Blossomed very full. First ripe June 21. Large amount of fruit. June 23 at best. Fruit stalk long and berries lie on ground. Fruit of large size, bright dark scarlet, round conical, or short, broad conical, sometimes quite irregular in form; productiveness, 9.5; quality, 8.5; firmness, 6; flesh, light.

Crop held out well in size and yield to close of season. Plant is productive and fairly vigorous, but berry lacks firmness and will only do for home use or local market.

Belle of Lacrosse. P.—Plants from W. F. Allen, Jr., Salisbury, Md. Plants medium strong growth, leaf-stalk usually short; leaflets medium size, ovate; teeth small, sharp; light green color; texture, papery. Blossomed full. First ripe June 21. Plants set a large amount of fruit. Crop at best June 26. Fruit, large; form, round conical or broad conical; color, bright dark scarlet; flesh, medium dark; productiveness, 9.5; quality, 8; firmness, 8.

Crop held out fairly well to the close of the season, though many of the later fruits were imperfect in shape. The plants rusted badly and are not likely to make a good stand for next season's fruiting.

Beverly. B.—Plants from Hale Bros., South Glastonbury, Conn. Plants of strong growth, leaf-stalk of medium length, stout; leaflets large, broad, ovate; teeth irregular; medium green color; texture, papery. Blossomed full. First ripe fruits June 21. Crop at best June 26. Fruit, large; round conical or long conical, sometimes slightly ridged; dark crimson color when fully ripe; productiveness, 8.5; quality, 9.5; firmness, 9.5.

Crop held out well in size and productiveness. Plants rusted but little. The fruit has the fault of not ripening at the tip. A promising berry for shipping purposes.

Bickle. P.—Plants from Prof. J. Troop, Purdue University, Ind. Plants are of medium strong growth; leaf-stalk usually short; leaflets, medium size, round, ovate; teeth, medium size, sharp; color, dark green; texture, tough. Blossomed full and set a moderate amount of fruit. First fruits ripe June 21. June 24–26, crop at best. Fruit small to medium in size; form, round conical; color, light scarlet; flesh, light; productiveness, 8.5; quality, 7; firmness, 7.

The berries are small, particularly after the first picking. The plants rust quite badly, and it seems to have nothing about it to recommend it.

Brunette. B.—Plants from G. Cowing, Muncie, Ind. Plants are of quite strong growth; leaf-stalk long, usually stout; leaflets large, broad, irregular ovate; teeth, large; medium to dark green in color. First fruits

ripe June 21. Crop at best June 26. Fruits large, round conical, regular; very dark crimson color; seeds sunken; flesh dark; productiveness, 8; quality, 9.5; firmness, 9.

Berry very attractive in appearance and the plants are strong and healthy. It is scarcely up to the standard in productiveness, but its high quality will make it valuable for family use. Promising for further trial.

California. B.—Plants from Slaymaker & Son. Plants are not of strong growth; leaf-stalk short, stout; leaflets, small to medium size, round ovate; teeth, medium size, sharp; color, medium green; texture, papery. First ripe fruits June 24. Crop at best June 28. Fruit, medium to small in size; long conical, usually with short neck; color, bright dark scarlet; seeds, prominent; flesh, usually dark; productiveness, 4; quality, 9.5; firmness, 9.

Fruits are small. Plants are healthy, but lack vigor of growth and productiveness. Not worthy of a place on the list.

Cameronian. B. Plants from J. W. Cameron, East Rochester, Ohio. Plants of strong growth; leaf-stalk long, quite stout; leaflets, large, round ovate; dark green color, tough in texture; teeth large, rounded. First ripe fruits June 21. Crop at best June 26. Fruit of medium size, round conical, regular in form, light scarlet color; flesh, light; productiveness, 8; quality, 7; firmness, 7.

Plants are strong growing, but rust quite badly. Fruits held out well in size, but are light in color and calyx parts too easily. Scarcely worthy of a place among the more promising sorts.

Cheyenne. P.—Plants from Stayman & Black, Leavenworth, Kan. Plants are not strong growing; leaf-stalk short, quite stout; leaflets of medium size, nearly round; color, dark green; texture, papery; teeth small, sharp. First ripe fruits June 21. Crop at best June 26. Fruit of medium size, long conical, bright scarlet in color; flesh rather light; productiveness, 7; quality, 7; firmness, 7.

Plants are fairly healthy, and the crop held out well. Many of the berries were imperfect in form. Possesses points of medium merit only.

Clark's Early. B.—Plants from W. F. Allen, Jr. Plants of medium strong growth; leaf-stalk usually short; leaflets large, ovate or broad ovate; medium green color; texture, papery; teeth usually large. First ripe fruits June 19. Crop at best June 24. Fruit medium to large in size; round ovate; dark crimson color; flesh dark; productiveness 8.5, quality 9.8, firmness 9.

Plants remained healthy and crop held out well in size of fruit and productiveness. It is early. The fruit is attractive in appearance, firm, and of excellent quality. A very promising variety, particularly for family use. It will also be a good market sort.

Clark's Seedling, B—Plants from Cleveland Nursery Co., Rio Vista, Va. Plants of medium strong growth; leaf-stalk of medium length; leaflets medium to large in size; irregular; broad ovate; medium green color; texture papery; teeth irregular. First ripe fruits June 21. Crop at best June 26. Fruit medium to large in size; short, round conical form; color, dark crimson; flesh, dark; productiveness 3, quality 9.5, firmness 9.

Fairly good in plant growth. Berry of good quality, firm, and an excellent shipper. Lacks productiveness.

Clyde. B.—Plants from Stayman & Black. First received as Cycloma. Plants of very strong growth; leaf-stalk long, slender; leaflets usually

small, ovate; color, medium green; texture, papery; teeth large, rounded. First ripe fruits June 21. Crop at best June 24–26. Fruit large to medium in size, round conical, or broad conical, bright dark scarlet color, flesh dark; productiveness 9.8, quality 8.5, firmness 9.2.

Plants remained healthy and crop held out well to close of season.. The plants are productive and the berry firm. One of the most promising of the new varieties for market purposes.

Dayton. B.—Plants from Matthew Crawford, Cuyahoga Falls, Ohio. Plants strong growing; leaf-stalk medium, rather stout; leaflets large, round or ovate, dark green color, texture thick; teeth large, irregular. First ripe fruits June 21. Fruit small, long conical, often with neck; flesh light color; productiveness 3, quality 9, firmness 8.

Plants healthy and of vigorous growth, but bear little fruit. Owing to its lack of productiveness it is not a promising variety.

Dr. Moraire. B.—Plants from H. E. Van Deman, Washington, D. C. Plants of weak growth; leaf-stalk long, slender; leaflets small, narrow ovate; color, light green; texture, tough; teeth of medium size, shallow. First ripe fruits June 21. Fruit of medium size, round conical; color light scarlet; flesh light; productiveness 3, quality 5, firmness 7.

Plants are weak, rust badly and bear but little fruit. Of no merit.

Dutter. B.—Plants from Matthew Crawford. Plants of medium strong growth; leaf-stalk usually long, quite slender; leaflets large, broad ovate; medium to dark green color; texture papery; teeth large, shallow. First fruits ripe June 24. Crop at best June 27. Fruit large, round conical or long conical, somewhat irregular and ridged; color bright scarlet; flesh dark; productiveness 7.5, quality 9, firmness 8.5.

Crop ripens late and holds out well. Plants are healthy and quite vigorous, but scarcely productive or firm enough to be profitable as a market variety.

E. P. Roe. B.—Plants from Matthew Crawford. Plants of weak growth; leaf-stalk medium length, slender; leaflets of medium size, ovate or obovate; color, medium green;texture papery; teeth small, pointed. Fruit large, broad conical or long conical, usually with neck; color, scarlet; flesh light; productiveness 5, quality 8.5, firmness 8.

Lacks vigor of plant and productiveness.

Estelle. B.—Plants of very weak growth. Fruit imperfect. Seems to be worthless.

Fairmount. B.—Plants of strong growth; leaf-stalk long, slender; leaflets medium in size, ovate, color medium green; texture papery; teeth irregular. First ripe fruits June 21. Crop at best June 24–26. Fruit large, depressed conical, slightly ridged; color, dark crimson; flesh dark: productiveness 9.5, quality 9, firmness 7.5.

Plants are healthy and productive. The fruit is attractive in appearance and rather soft for shipment, but its productiveness and good quality make it valuable for home use.

Glenfield. B.—Plants from Stayman & Black. Plants strong growing; leaf-stalk long, slender; leaflets medium size, ovate; color, medium green; texture papery; teeth large, deep cut, sharp. First ripe fruits June 21. Fruit of medium size, long conical, usually with neck; color, dark crimson; flesh dark; productiveness 5, quality 9, firmness 7.

The plants blossomed very full and set a large amount of fruit, but rusted so badly that the crop soon ran out. Its only hope is in thorough spraying.

Greenville. P.—Plants from E. M. Buechly, Greenville, Ohio. Plants of strong growth; leaf-stalk usually long, quite stout, but reclining; leaflets usually large, round ovate, turned up at edge, dark green, texture papery; teeth large, rounded. First ripe fruits June 21. Crop at best June 26–28. Fruit large, round conical or depressed conical, sometimes ridged; color, bright crimson; flesh dark; productiveness 9.5, quality 8, firmness 7.

The plants are strong growing, healthy and productive. The crop held out well to close of season. The fruit is lacking in firmness, otherwise excellent. A promising variety for use in a local market.

Gypsy. P.—Plants from Slaymaker & Son. Plants low growing but vigorous; leaf-stalk short; leaflets of medium size, ovate, dark green, texture thick and tough; teeth large, rounded. First ripe fruits June 21. Crop at best June 24. Fruit of medium size, round conical; color, dark crimson; flesh dark; productiveness 9, quality 9, firmness 9.

Plants remained healthy, but the crop did not hold out as well as it promised early in season. The fruit possesses excellent qualities and the variety is well worthy of further trial.

Harmon. B.—Plants from Slaymaker & Son. Plants of strong growth; leaf-stalk long, stout; leaflets large, usually broad ovate, medium green color, texture tough; teeth large, shallow. First ripe fruits June 21. Fruit large, round conical, often with short neck, color very dark, flesh dark; productiveness 4, quality 9.5; firmness 8.

Plants vigorous and healthy but lack productiveness.

Hattie Jones. P.—Plants from J. H. Haynes. Plants strong; leaf-stalk long, stout; leaflets large, broad ovate, color medium green, texture papery. First ripe fruits June 21. Crop at best June 26. Fruit medium to large in size, round conical or depressed conical, light scarlet color, flesh white; productiveness 9.5, quality 6, firmness 7.

Excellent in plant qualities and quite productive, but the fruit is light colored and lacking in flavor and firmness.

Hermit. B.—Plants from F. L. Piers, New Providence, Ind. Plants of strong growth; leaf-stalk long, slender; leaflets large, ovate; color dark green; texture thick; teeth regular. First ripe fruits June 21. Crop at best June 24. Fruit large, round conical, regular; bright crimson color; productiveness 8, quality 8, firmness 8.

Crop held out well and plants remained healthy to close of season. A variety of medium merit.

Huntsman. P. B.—Plants from W. A. Huntsman, Lawson, Mo. Plants of strong, vigorous growth; leaf-stalk long, stout; leaflets large, broad ovate, color dark green, texture tough. First ripe fruits June 21. Crop at best June 26. Fruit large, round conical, regular in form; color dark crimson; flesh dark; productiveness 8.5, quality 9, firmness 8.

Plants very strong and healthy; fairly productive. Crop held out well. Fruit attractive in appearance. Promising for home use or local market.

Hyslop. B.—Plants from Slaymaker & Son. Plants of medium strong growth; leaf-stalk very long, quite stout; leaflets large, ovate, medium green in color; texture papery; teeth large. First fruits ripe June 21.

Fruit small, imperfect. Plants are strong and healthy, but bear little fruit. Not promising.

Iowa Beauty. B.—Plants from J. T. Lovett Co., Little Silver, N. J. Plants of medium growth; leaf-stalk long, stout; leaflets large, round or broad ovate, color dark green, texture thick and tough; teeth large. First

ripe fruits June 21. Crop at best June 26. Fruit large, round conical, color bright crimson, flesh dark; productiveness 7, quality 10, firmness 8.5.

Berry of excellent quality and holding out well in size to close of season. Plants of fair growth and healthy, but scarcely productive enough. Of medium merit.

Jones Seedling. B.—Plants from J. H. Haynes. Plants of medium strong growth; leaf-stalk short; leaflets medium to large in size, round ovate, medium green color, texture tough; teeth large, rounded. First ripe fruits June 21. Fruit large, short, depressed conical form, color dark crimson, flesh dark; productiveness 8.5, quality 9, firmness 8.5.

Plants are healthy and moderately vigorous. Fruit of handsome appearance and good quality. Holds out well. There are several varieties in the section. Possibly a mistake made by the sender of the plants, or by us in setting. The large majority of the plants are as above described.

Katie. B.—Plants from J. H. Haynes. Plants of strong growth; leaf stalk long, slender; leaflets large, broad ovate, medium to dark green color; texture papery; teeth large, pointed. First fruits ripe June 21. Crop at best June 26. Fruit medium to large in size, round conical or broad depressed conical; dull crimson color; flesh usually dark; productiveness 7, quality 8.5, firmness 7.5.

Plants strong and healthy, but not up to standard in productiveness. Medium merit.

Leader. B.—Plants from Matthew Crawford. Plants of fair growth; leaf-stalk of medium length, stout; leaflets of medium size, nearly round, color medium green, texture thick. First ripe fruits June 21. Crop at best June 24. Fruit large, long conical, bright dark crimson color, flesh dark; productiveness 8.5, quality 9.5, firmness 9.

Fruit attractive in form and color and firm. Plants quite productive but lack vigorous growth.

Leroy. P.—Plants from J. H. Haynes. Plants of strong growth; leaf-stalk of medium length, stout; leaflets medium size, narrow ovate, color dark green; texture papery; teeth large, pointed. First ripe fruits June 19. Crop at best June 24. Fruit large, depressed conical, sometimes ridged; color dark crimson; seeds prominent; flesh dark; productiveness 9; quality 8.5; firmness 8.

Plants are of vigorous growth and rust but little. The crop holds out well in size and productiveness. The fruit is not very firm but the seeds are prominent, making it a fairly good shipper. Early. Promising.

Leviathan. B.—Plants from Matthew Crawford. Plants of fair growth; leaf-stalk of medium length; leaflets medium size, round or ovate; color dark green; texture thick; teeth regular, sharp. First ripe fruits June 21. Crop at best June 24. Fruit large, broad depressed; color, light scarlet; flesh light; productiveness 8.5, quality 6, firmness 5.

Plants are healthy and crop holds out well in size. Berry is light colored and lacking in quality and firmness.

Lillie Monroe. B.—Plants of moderate growth; leaf-stalk long, stout; leaflets medium to large in size, round ovate; color medium green; texture tough; teeth rounded. shallow. First ripe fruits June 19. Crop at best June 24. Fruit large, depressed conical, ridged, dull dark scarlet color, flesh light; productiveness 5, quality 8, firmness 7.

Plants rusted badly at close of season. Not productive, and rather soft.

Lincoln. B.—Plants from Slaymaker & Son.

Plants of strong growth; leaf-stalk long, stout; leaflets large, ovate; color dark green; texture tough; teeth large, rounded. First ripe fruits June 21. Crop at best June 26. Fruit large, round conical, often with short neck; light scarlet color; flesh light; productiveness 9, quality 7, firmness 5.

Plants are strong, healthy and productive. Berry light in color and lacks firmness.

Magnate. P.—Plants from Stayman & Black. Plants moderately strong; leaf-stalk long, slender; leaflets large, ovate or obovate; color medium green; texture papery; teeth large, pointed. First fruits ripe June 22. Crop at best June 26. Fruit of medium size, long conical, bright scarlet color, flesh usually light; productiveness 6, quality 8, firmness 8.5.

Crop holds out well. Plants are healthy but not productive.

Mystic. B.—Plants from J. N. Haynes. Plants of strong growth; leaf-stalk medium to long, rather stout; leaflets medium to large in size, ovate, dark green in color, texture papery; teeth small, pointed. First ripe fruits June 26. Crop at best June 29. Fruit medium to large in size, round conical, bright dark crimson color, flesh usually light; prroductiveness 6, quality 9.5, firmness 9.

Plant strong, vigorous and rusts but little. Berry excellent in quality and firm. Plant lacks productiveness.

Neptune. P.—Plants from Henry Young, Ada, Ohio. Plants of strong growth; leaf-stalk long, stout; leaflets large, round or round ovate, color dark green, texture tough; teeth large. First ripe fruits June 23. Crop at best June 27. Fruit medium to large, round conical with short neck, slightly ridged; flesh light; productiveness 6, quality 7, firmness 5.

Plant very vigorous and healthy. Possesses no other points of excellence.

Nigger. B.—Plants from John Little. Plants of rather small growth; leaf-stalk long; leaflets medium to large in size, broad ovate; color medium green; texture tough; teeth large, rounded. First ripe fruit June 21. Crop at best June 24. Fruit small, round conical, dark crimson color; flesh dark; productiveness 6, quality 10, firmness 9.

Plants are of rather small growth, healthy, but not very productive. Fruit is small, of high quality, dark color and regular form. Not of special merit.

No. 1 (Allen). P.—Plants from W. F. Allen. Plants of fair growth; leaf-stalk medium to long, stout; leaflets medium to large in size, ovate; color, dark green; texture, papery; teeth, medium size, rounded. First ripe fruits June 22. Crop at best June 26. Fruit of medium size, round conical or long conical; bright crimson color; flesh, dark; productiveness, 9; quality, 9; firmness, 8.

Plants healthy, moderately vigorous, and productive. Crop held out well. Berry of attractive appearance and good quality. Promising.

No. 3 (Allen). B.—Plants from W. F. Allen. Plants of strong growht; leaf-stalk long; leaflets large, ovate; color, dark green; texture, papery; teeth, medium size, sharp. First fruits ripe June 23. Crop at best June 29. Fruit large, round conical, bright crimson; productiveness, 7.5; quality, 8.5; firmness, 7.

Plants are strong and healthy, but do not produce much fruit.

No. 3 (Bell). B. Plants from William Belt, Williamsburgh, Ohio. Plants of strong growth; leaf-stalk long, stout; leaflets large, broad ovate;

color, medium to light green; texture, papery. First ripe fruits June 21. Crop at best June 26. Fruit large, round conical or broad conical; color, bright, light scarlet; flesh, medium in color; productiveness, 9; quality, 8; firmness, 8.

Promised well early in season, but plants weakened and rusted badly, and many berries did not mature.

No. 1 (*Engle*). B.—Plants from C. Engle, Paw Paw, Mich. Plants rather weak in growth. Fruit large, but irregular in shape, and produced only in small quantities. Not promising.

No. 2. (*Feicht.*) B.—Plants fron David Feicht, Little York, Ohio. Plants of strong growth; leaf-stalk usually long; leaflets of medium size, ovate; teeth sharp. First ripe fruits June 18. Crop at best June 24. Fruit medium to large in size; round conical; crimson color; flesh dark; productiveness 9.5, quality 8, firmness 8.5.

Plants strong and healthy. Crop ripened early and held out well. Its productiveness makes it promising for home use or local market.

No. 3. (*Feicht.*) P.—Plants from David Feicht. Plants of rather weak growth; leaf-stalk medium to long, rather stout; leaflets large, narrow ovate, edge turned toward center, medium green in color; texture, papery. First ripe fruits June 21. Crop at best June 26. Fruit large, irregular, ridged, conical; color, light crimson; productiveness 8, quality 7, firmness 9.

Plant rusted quite badly at close of season. Lacks vigor of plant growth.

No. 2. (*Cameron.*) B.—Plants from J. W. Cameron, East Rochester, Ohio. Plants of strong growth; leaf-stalk medium to long: leaflets medium to large, round ovate; color, dark green; texture, tough. First fruits ripe June 20. Crop at best June 24. Fruit of medium size, long conical, usually with neck; bright crimson color; seeds, prominent; flesh, dark; productiveness 8.5, quality 9, firmness 8.

Plants are healthy, strong growing and fairly productive. Berry of fine appearance, good quality and holds out well to close of season. Promising.

No. 6. (*Cameron.*) P. B.—Plants from J. W. Cameron. Plants of medium strong growth; leaf-stalk long, quite stout; leaflets large, ovate, medium to light green color; texture, papery. First fruits ripe June 22. Crop at best June 27. Fruit of medium size, round conical or broad conical; color, bright scarlet; flesh, dark; productiveness 4, quality 8.5, firmness 8.5.

Plants are healthy and fairly vigorous, but are not productive.

No. 13. (*Cameron.*) P.—Plants from J. W. Cameron. Plants not strong growing; leaf-stalk of medium length; leaflets small to medium in size, round ovate, color medium green; texture, tough; teeth small, sharp. First fruits ripe June 21. Crop at best June 26. Fruit of medium size, round conical, usually ridged; color, bright crimson; productiveness 8, quality 8, firmness 7.5.

Crop held out well in size of fruit to close of season. Plants lack vigor of growth, rust badly and do not produce many runners.

No. 31 (*Haynes*). P.—Plants from J. H. Haynes. Plants of very strong growth; leaf-stalk long, slender; leaflets of medium size, ovate; color, light green; teeth irregular, sharp. First ripe fruits June 21. Crop at best June 26 Fruit of medium size, round conical, somewhat irregular form, bright scarlet color; flesh, light; productiveness 5, qual ity 6, firmness 6.

Plants rusted badly toward close of season. Crop did not hold out well. Not promising.

No. 18 (*Little*). B.—Plants from John Little, Granton, Ontario. Plants are not of strong growth; leaf-stalk medium to long; leaflets small, narrow ovate; color, medium green; texture, tough. First ripe fruits June 18. Crop at best June 24–25. Fruit of medium size, round conical, bright dark crimson color, flesh dark; productiveness 8.5, quality 8, firmness 8.5.

Plants rusted badly toward close of season and could not mature crop. Lacking in plant growth and vigor.

No. 26 (*Little*). B.—Plants from John Little. Plants of medium growth; leaf-stalk long, quite stout; leaflets large, round ovate; color, medium green; texture, papery; teeth large, rounded. First ripe fruits June 21. Crop at best June 26. Fruit large, irregular, ridged; color, bright dark scarlet, flesh light; productiveness 9, quality 9, firmness 8.

Crop held out well in size, though the berry is irregular in shape. Plants are not of strong growth and rust toward close of season. Worthy of further trial.

No. 42 (*Little*). B.—Plants from John Little. Plants of medium growth; leaf-stalk medium to long; leaflets of medium size, ovate; color, medium to dark green; texture tough; teeth sharp. First ripe fruits June 21. Crop at best June 24–26. Fruit large, round conical, crimson color, flesh dark; productiveness 9, quality 9, firmness 8.

Crop held out fairly well. Fruit attractive in appearance and of good quality. Plant lacking in vigor of growth; rusts considerably. Of fair promise.

No. 3 (*Stayman*). B.—Plants from Stayman & Black. Plants of very strong growth; leaf-stalk usually long, stout; leaflets of medium size, narrow ovate; color medium green; texture papery; teeth sharp. First ripe fruits June 21. Crop at best June 24. Fruit of medium size, long conical; color dark crimson; flesh usually dark; productiveness 9.5, quality 7, firmness 8.5.

Plants are strong, healthy and productive. Crop held out well. The fruit has a stong acid flavor. Promising.

No. 2 (*J. S.*). B.—Plants are moderately vigorous and healthy. The fruit is large and of excellent quality. The plants are not productive.

No. 4 (*J. S.*). P.—Plants of moderately strong growth, healthy but not productive enough. Berry of attractive appearance and high quality.

No. 6 (*J. S.*). P.—Plants of stong growth; leaf-stalk of medium length and quite stout; leaflets medium size, ovate; color light green; texture tough; teeth sharp. First ripe fruits June 21. Crop at best June 26. Fruit large, round conical, ridged; color bright dark scarlet; productiveness 9.5, quality 7, firmness 6.

Plants rusted badly toward close of season. Berry rather soft. The plants are productive and the berry is attractive in appearance. It would be an excellent variety if the plants did not rust.

No. 34 (*Thompson*).—Plants from Cleveland Nursery Co. The plants are of medium strong growth. Fruit of medium size, round conical; color bright crimson; productiveness 5, quality 8, firmness 8.

Plants rust quite badly and are not productive. Berry parts from calyx easily, making it difficult to pick.

No. 77 (*Thompson*). B.—Plants from Cleveland Nursery Co. Plants of rather weak growth; leaf-stalk of medium length, slender; leaflets small to medium size, narrow ovate; color medium green; teeth irregular, pointed. First fruits ripe June 19. Crop at best June 23. Fruit small,

long conical; color bright crimson; productiveness 9.5, quality 7, firmness, 5.

Plants lack vigor of growth; rusted badly at close of season. The fruit is small in size and lacks quality and firmness.

Odessa. P.—Plants from J. W. Cameron. Plants of medium strong growth; leaf-stalk long, quite stout; leaflets large, usually broad ovate; color, medium green; texture, papery; teeth large, rounded. First fruits ripe June 23. Crop at best June 27. Fruit large, irregular, ridged, bright scarlet, flesh light; productiveness 5, quality 7, firmness 7.

Plants of fair growth, rusted some toward close of season. Berry irregular in shape; does not ripen at tip. Not productive.

Ohio Monarch. B.—Plants of very strong growth; leaf-stalk long, quite stout; leaflets large, broad, ovate, color dark green, papery in texture; teeth large, sharp. First ripe fruits June 23. Crop at best June 27. Fruit very large, long, triangular, conical; color bright scarlet; flesh light.

Excellent in plant qualities. Berries large, but few of them.

Pawnee. B.—Plants from Stayman & Black. Plants of strong growth; leaf-stalk long, slender; leaflets of medium size, long, narrow ovate; color, medium green; texture tough. First ripe fruits June 19. Crop at best June 24. Fruit medium to large in size, round conical, usually with short neck; color, dark crimson; flesh dark; productiveness 7.5, quality 9.8, firmness 7.

Plants strong growing, but rusted at close of season. Berry attractive in appearance, and of high quality; not up to standard in productiveness, owing to the leaf rust. Had it not been for this it would have been among the best early sorts.

Primate. B.—Plants from Stayman & Black. Plants of strong growth; leaf-stalk, long, slender; leaflets of medium size, ovate; color, medium green; texture, tough; teeth, sharp. First fruits ripe June 21. Crop at best June 24. Fruit of medium size, long conical, often with short neck; bright dark crimson color; flesh dark; productiveness 6, quality 6, firmness 7.

Plants of strong growth but rusted quite badly. Crop soon gone. A large part of the later berries were small and did not mature. Not promising.

Smeltzer's Early. B.—Plants from Frank Smeltzer, Van Buren, Ark. Plants of strong growth; leaf-stalk very long, quite stout; leaflets large, ovate; color, medium to light green; texture tough. First ripe fruits June 19. Crop at best June 23–24. Fruit of medium size, round conical, or long conical; color, dark crimson; flesh dark; productiveness 8.5, quality 9, firmness 8.5.

Plants strong; a little rust at close of season. One of the earliest varieties to ripen the crop. Fruit of fair size, good quality and appearance. Promising as an early sort.

Standard. B.—Plants from G. H. & J. H. Hale. Plants of very steady growth; leaf-stalk of medium length, stout; leaflets large, broad ovate, color medium green, texture papery; teeth irregular. First fruits ripe June 21. Crop at best June 26. Fruit large, round conical, color bright dark crimson, flesh of medium color; productiveness 9, quality 9.5, firmness 7.

Plants weakened toward close of season and some rust appeared. Berry of regular form, handsome appearance and good quality; lacking in firmness. Productive. Promising for home use and local market.

Stevens. B.—Plants from Slaymaker & Son. Plants of strong growth; leaf-stalk long, slender; leaflets small, narrow ovate, medium to light green in color; texture papery; teeth small, sharp. First ripe fruits June 21. Crop at best June 24. Fruit of medium size, round conical, dark crimson color; flesh dark, productiveness 9, quality 9, firmness 8.

Crop held out well. A little rust on plants. Berry of fine appearance and good quality. Promising for near-by markets.

Southard. B.—Plants from G. H. & J. H. Hale. Plants of medium strong growth; leaf-stalk of medium length, stout; leaflets small to medium in size, narrow ovate, color medium green; texture papery; teeth small, sharp. First ripe fruits June 19. Crop at best June 24. Fruit large, round conical, bright scarlet color; flesh light; productiveness 8, quality 7, firmness 8.

This variety did not fulfil early promise, as the crop did not hold out well. Plants of fair growth and quite healthy, but many of the berries were small.

Surprise. B.—Plants from Slaymaker & Son. Plants of strong growth; leaf-stalk long, stout; leaflets medium to large in size, round or broad ovate; color medium to dark green; texture tough. First fruits ripe June 21. Crop at best June 26. Fruit of medium size, long conical, regular form, bright scarlet color; flesh dark; productiveness 6, quality 8, firmness 8.

Plants of good growth and healthy. Crop held out fairly well, but not enough of it. Nothing special to recommend it.

Swindle. P.—Plants from G. H. & J. H. Hale. Plants promised well early in season. Blossomed very full and set a large amount of fruit. Plants soon attacked with rust so badly that scarcely any fruit matured.

It seems to be of no value here unless thoroughly sprayed, but when free from rust it is an excellent shipper.

Tom Walker. P.—Plants from Albaugh Nursery Co., Tadmor, Ohio. Plants of very strong growth; leaf-stalk long, slender; leaflets vary much; teeth large, rounded. First fruits ripe June 21. Crop at best June 26. Fruit large, round conical; color dark crimson; flesh dark; productiveness 9, quality 8, firmness 8.

Plants strong and quite healthy. Berry of attractive appearance. Productive. Promising for home market purposes.

Westlawn. P.—Plants from C. P. Bauer, Judsonia, Ark. Plants are of medium strong growth and remained healthy. There were scarcely any fruits on plants, but it should not be condemned until after a second trial.

Weston. P.—Plant of strong growth; leaf-stalk long; leaflets medium to large in size, broad ovate; color, dark green; texture, thin but tough. First ripe fruits June 21. Crop at best June 24-27. Fruit large, broad conical, somewhat ridged, bright scarlet color; flesh, medium dark; productiveness, 9.8; quality, 8; firmness, 8.5.

Plants very strong and healthy. Crop held out best of any variety. Berry of attractive appearance and fair quality, seeds prominent, making it a good shipper. One of the best varieties grown here this season.

Williams. B.—Plants from Matthew Crawford. Plants of medium strong growth; leaf-stalk of medium length, slender; leaflets narrow ovate, medium green color, texture papery; teeth irregular, sharp. First ripe fruits June 21. Crop at best June 24. Fruit large, round conical or broad conical, dark crimson color, flesh dark, productiveness 8.5, quality 8.5, firmness 9.

Plants rusted badly toward close of season, and the crop did not hold out well on that account; had it not been for the rust it would have made a good showing as a shipping berry.

Yankee Doodle. P.—Plants from Geo. Q. Dow, North Epping, N. H. Plants of very strong growth; leaf-stalk varies in length; leaflets large, broad ovate; color dark green; texture tough. First ripe fruits June 21. Crop at best June 24. Fruit large to medium in size, round conical or depressed conical, bright scarlet color, flesh light; productiveness 9, quality 8, firmness 9.

Plants strong, healthy and productive. Crop held out fairly well. Promising as a market sort.

In the preceding notes many varieties are spoken of as promising except that plants rust badly. The Bordeaux mixture is an effectual remedy for this disease. Varieties, which under ordinary conditions rusted so much that but a small portion of the crop ripened properly, were sprayed in the fall, early in the spring and again after blossoming and were almost free from rust. So the fact that a variety, otherwise good, rusts badly is not so serious a fault as it would be did we not have so simple and effectual a remedy available as the Bordeaux mixture.

SUMMARY.

The following grouping shows, in a small space, our opinion of the varieties tested here the past season.

GROUP I.

Varieties possessing points of excellence superior to those of the average berry and which seem deserving of a place among the best sorts.

Clyde.	No. 1 (Allen).	Weston.
Greenville.	No. 2 (Feicht).	Yankee Doodle.
Leroy.	No. 3 (Stayman).	

GROUP II.

Varieties having many points of merit but requiring a further trial to determine their place:

Afton.	Gypsy.	Pawnee.
Beauty.	Huntsman.	Smeltzer's Early.
Belle of Lacrosse.	Leader.	Standard.
Beverly.	No. 3 (Belt).	Stevens.
Brunette.	No. 2 (Cameron).	Swindle.
Clark's Early.	No. 26 (Little).	Tom Walker.
Fairmount.	No. 6 (J. S.).	Williams.

GROUP III.

Varieties possessing some good points, but of medium merit only:

Accomack.	Leviathan.	No. 4 (J. S.).
Alabama.	Lillie Monroe	No. 34 (Thompson).
Bickle.	Lincoln.	No. 77 (Thompson).

BULLETINS 101-102

1893

AGRICULTURAL EXPERIMENT STATION

STATE AGRICULTURAL COLLEGE, MICHIGAN.

BULLETIN 101

1. Composition of Wheat and Straw.
2. Composition of Certain Forage Plants.
3. Adulteration of Ground Feed.
4. Mineral Residues in Sprayed Fruits.

BULLETIN 102

Insects Injurious to Celery.

AGRICULTURAL COLLEGE, MICH.
DECEMBER 1, 1893.

LANSING
ROBERT SMITH & CO., STATE PRINTERS AND BINDERS
1893

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South Haven, Van Buren County, 10 acres rented; 5 acres deeded; Hon. T. T. Lyon, President State Horticultural Society, Local Agent.

BULLETIN 101.

CHEMICAL DEPARTMENT.

I.—Composition of wheat at different periods of ripening; of the straw at the same periods.

II.—Composition of certain forage plants: Spurry: Lathyrus Silvestris: Mint hay.

III.—Adulteration of ground feed.

IV.—Mineral residues in sprayed fruit.

I. COMPOSITION OF CLAWSON WHEAT AT DIFFERENT PERIODS OF RIPENING.

Thirteen years ago the chemical department of this college made an investigation to determine the composition of wheat at successive stages of ripening, with special reference to the time at which are developed the greatest quantity of grain and the highest food value of the same. The results were published in the Report of the Board of Agriculture for 1881, and were also printed in the U. S. Census for 1880. This was before the era of bulletins of experiment stations, and reached only a small part of the farming public. The subject is so important and far-reaching in its consequences that this experiment station decided to make another and more extended investigation on this subject. This was made with special reference to the conditions and demands of Michigan farming.

The experiment began by gathering a bundle of wheat at 2 P. M., June 14, 1892, and another similar bundle at the same hour for 45 successive days, ending on July 29. The bundles were gathered in a field of wheat of very uniform appearance and quality, securing a fair representative of the growing crop. The wheat had headed out and was in blossom, but the berry was still very immature. The successive bundles of wheat were labeled and placed in a dry and well ventilated room to secure what ripening and development were possible from the nutritive material in the stalk. When thoroughly dry, the grain was rubbed out by hand, screened, and bottled for analysis. The straw was reserved for separate analysis. Separate specimens of wheat from these consecutive cuttings were mounted in show bottles and exhibited at the Columbian Fair in the Michigan Agricultural College exhibit in Hall of Liberal Arts, and at the close of the Columbian Fair will be on exhibition at the chemical laboratory of the Agricultural College.

The cutting of the wheat was begun when the grain was very immature, the berry just formed, and the development finally reached by this grain was mostly due to growth after cutting and before drying of the stalk. The cutting was begun at this early date in order to estimate the value of the straw for fodder at different periods. As we have no records of the feeding value of straw at different periods of ripening, it was thought that this subject demanded consideration in a State where the value of straw in stock feeding is recognized.

RELATIVE QUANTITY OF GRAIN AT EACH TIME OF CUTTING.

The amount of grain as influenced by the period of cutting is a question of practical importance to the farmer. In making this estimate attention is confined to the weight of the dry berry, because variation in amount of grain attendant upon changes during growth arises from variation in the size and weight of the kernel and not from any variation in the number of grains growing on a given area. New kernels would not form during the period of ripening, and those already formed would pass through the successive stages of development more or less completely. In this way several sources of error were eliminated which are incidental to measuring the grain produced on a given area, such as loss of grain by shelling, and from incomplete threshing, the varying productiveness of different plots of soil, etc. All broken kernels and foreign substances were removed, but no kernels were rejected because of incomplete development. Ten grams were weighed out on a delicate balance and the grains carefully counted; this repeated up to ten times, and one-tenth of the sum of kernels in ten times ten grams was taken as the true number of grains for ten grams. The average product of grain at the several stages of growth would be directly as the weight of the kernels, and inversely as the number of kernels required to produce the given weight.

IRREGULAR PROGRESS IN GROWTH.

Some irregularities appear in the progressive development both of the grain and straw. These are partly to be explained by the climatic conditions prevailing during the period. There were two spells of cold and

cloudy weather, fourth to seventh cutting (June 17 to 20), and again, the nineteenth to twenty-fourth cutting (July 2 to 7), when growth seemed to be nearly arrested for a time, when the mean temperature of the open air and of the soil at the depth of three inches show a marked decline in temperature for the season. The pause in the curve of summer growth in all the plant tissues is evidence of this control over their development by physical agencies even in the heart of summer.

For purposes of comparison, Table II includes the mean daily temperature of the open air, of the soil at depth of three inches, the highest and the lowest temperatures for each day, the amount of cloudiness, and the rainfall.

TABLE I.

Analysis of Clawson wheat cut at intervals of 24 hours for 46 days, June 14 to July 29, 1892. Results calculated for dry substance.

No. of cutting.	No. of kernels in 10 grams.	Ash.	Ether extract.	Crude fiber.	N. free extract.	Crude protein.	Total albuminoids.	Amides.	Condition of crop at time of gathering specimens.
1	1,708	4.72	2.42	4.85	51.79	36.22	27.09	9.13	Just out of blossom; grain set.
2	1,770	4.70	2.39	4.99	53.04	34.88	26.77	8.11	No apparent change.
3	1,365	4.13	2.30	4.38	59.61	29.58	24.38	5.20	Grain a trifle larger.
4	1,287	3.89	2.35	4.26	60.16	29.34	23.43	5.91	Straw slightly yellow at butt.
5	1,083	3.94	2.35	3.86	61.28	28.57	23.85	4.72	Grain full of sweet sap.
6	1,032	3.58	2.18	4.15	65.16	24.93	20.18	4.75	Grain about half size; sweeter.
7	1,036	3.42	2.28	4.06	67.48	22.76	17.98	4.78	Starch grains appear.
8	856	3.24	2.29	3.78	70.78	19.91	15.93	3.98	Straw turning yellow; grain more yellow.
9	780	2.93	2.35	3.39	72.23	19.10	14.44	4.66	Grain nearly full size.
10	701	2.66	2.29	3.29	74.04	17.72	14.49	3.23	Grain in milk; firmer.
11	621	2.69	1.87	3.28	77.14	15.02	12.85	2.17	Still in milk; firmer.
12	537	2.55	1.96	2.91	77.89	14.69	12.73	1.96	Grain the same; straw yellower.
13	499	2.39	2.13	2.77	78.10	14.61	12.17	2.44	Same.
14	463	2.43	2.12	2.57	78.41	14.47	12.58	1.89	Grain in milk; leaves drying up.
15	444	2.42	1.92	2.65	80.78	12.33	10.37	1.96	Stalks yellow; grain turning yellow.
16	412	2.37	2.25	2.48	80.84	12.06	10.33	1.73	Grain not so sappy.
17	389	2.30	2.00	2.34	81.25	12.11	10.41	1.71	Grain still milky; leaves dry; straw ripe at base.
18	363	2.35	2.05	2.28	81.01	12.31	10.83	1.48	Some grains milky; others doughy.
19	346	2.29	2.10	2.24	80.81	12.56	10.79	1.77	Same.
20	360	2.27	2.13	2.22	80.62	12.76	11.20	1.56	No change; restrained by rain.
21	326	2.25	2.13	2.13	81.51	11.98	10.72	1.26	" " "
22	307	2.19	2.11	2.11	82.02	11.57	10.16	1.41	Ripening rapidly; doughy.
23	301	2.14	2.14	2.15	81.88	11.69	10.30	1.39	Grain quite yellow.
24	290	2.07	2.07	2.01	82.04	11.81	10.22	1.58	Grain yellow and firmer.
25	271	2.14	2.20	2.04	81.89	11.73	11.02	.71	Field full yellow.
26	268	2.11	2.13	1.87	82.15	11.74	10.53	1.21	" " "
27	261	2.13	2.08	2.04	82.06	11.69	10.76	.93	Grain getting hard and flinty.
28	260	2.17	2.27	1.84	81.77	11.95	10.97	.98	Ready to cut.
29	253	2.13	2.18	1.93	81.87	11.89	11.03	.76	Grain harder; head turning brown.
30	248	2.11	2.22	2.04	81.80	11.83	11.03	.80	Straw ripe; grain getting dry.
31	255	2.11	2.17	1.85	81.49	12.38	11.30	1.08	Grain in some heads quite floury.
32	246	2.14	2.13	1.77	81.61	12.35	11.28	1.07	Straw all yellow; whole field ripe.
33	249	2.15	2.23	1.89	81.48	12.25	11.60	.65	Grain harder; shows more white flour.
34	250	2.19	2.16	1.94	81.76	11.95	11.09	.86	Shells out badly.
35	249	2.14	2.17	1.84	81.56	12.29	11.44	.85	Grain plump; no shrinkage.
36	249	2.09	2.17	1.83	81.83	12.08	11.15	.93	Some grains show shrinkage.
37	240	2.13	2.20	1.95	81.09	12.63	12.02	.61	Many kernels shrunken.
38	242	2.15	2.23	1.82	81.40	12.40	12.03	.37	Straw getting broken and a little rusty.
39	248	2.13	2.15	1.89	80.36	13.47	12.12	1.35	" " " "
40	247	2.08	2.15	1.98	80.91	12.88	11.80	1.08	Straw very rusty; grain hard enough to grind.
41	248	2.11	2.22	1.93	80.54	13.20	12.99	.21	Straw nearly all broken down; getting mouldy; very tender.
42	251	2.12	2.26	1.97	81.05	12.60	11.86	.74	
43	248	2.12	2.28	1.96	80.82	12.82	11.80	1.02	
44	245	2.07	2.22	1.89	80.98	12.84	11.84	1.02	
45	249	2.07	2.18	1.95	80.96	12.84	11.61	1.23	
46	251	2.11	2.24	2.01	80.74	12.90	11.90	1.00	

TABLE II.

Analysis of wheat straw at 46 successive daily cuttings, June 14 to July 29, 1892.

No. of cutting.	Ash.	Ether extract.	Crude fiber.	N. free extract.	Crude protein.	Albuminoids.	Amides.	Climatic conditions during period of growth.					
								Mean temperature of open air.	Highest temperature for the day.	Lowest temperature for the day.	Temperature of soil three inches deep.	Percentage of cloudiness.	Rainfall in inches.
1	6.11	1.66	41.08	48.19	2.96	1.94	1.02	68⅓°	76°	58°	72⅓°	40	
2	6.17	1.60	41.11	48.16	2.96	1.94	1.02	72⅓°	81°	65°	71⅓°	20	
3	6.64	1.53	39.87	49.50	2.46	1.88	.58	76°	87°	62°	74⅔°	70	* .37
4	6.43	1.46	40.04	49.68	2.39	1.49	.90	72⅓°	81°	65°	77⅓°	66	
5	6.14	1.43	40.34	49.77	2.32	1.49	.83	68⅓°	74°	66°	73⅓°	100	* .22
6	6.34	1.36	40.45	49.47	2.38	1.64	.74	69⅔°	78°	65°	70°	70	* .33
7	6.06	1.24	40.20	50.07	2.43	1.62	.81	71⅔°	81°	63°	71⅓°	40	
8	6.46	1.22	39.77	50.12	2.43	1.62	.81	71⅔°	80°	65°	70⅔°	50	.03
9	5.93	1.25	40.00	50.42	2.40	1.53	.87	69°	78°	65°	70°	100	* .50
10	6.09	1.17	41.28	49.00	2.46	1.60	.86	70⅔°	77°	61°	71⅔°	90	
11	5.75	1.19	37.97	52.70	2.39	1.65	.74	69⅔°	77°	54°	70⅔°	75	
12	5.59	1.16	38.76	52.11	2.38	1.65	.73	63°	71°	53°	68°	30	
13	5.81	1.09	40.17	50.60	2.33	1.60	.73	64⅔°	74°	59°	70°	70	* .95
14	6.03	1.06	41.35	49.19	2.37	1.57	.80	59⅓°	68°	52°	66°	80	
15	5.42	1.11	37.44	53.59	2.44	1.58	.86	62⅔°	72°	55°	66°	20	* .13
16	4.89	1.16	39.64	51.94	2.37	1.64	.73	63°	70°	57°	64°	35	
17	6.09	1.16	39.47	50.92	2.36	1.87	.49	58⅓°	69°	42°	63⅓°	35	
18	6.09	1.16	39.98	50.40	2.37	1.87	.50	58⅓°	68°	48°	63°	30	
19	5.83	1.27	40.83	49.68	2.39	1.66	.63	56°	61°	53°	58⅓°	65	
20	5.67	1.22	42.42	48.38	2.31	1.66	.65	51⅓°	68°	45°	60⅓°	100	* .58
21	6.11	1.19	40.32	50.08	2.30	1.58	.72	61⅓°	73°	48°	62⅔°	60	* .38
22	6.39	1.33	40.02	49.94	2.32	1.66	.66	63⅓°	75°	48°	68°	16	
23	5.76	1.32	41.37	49.25	2.30	1.66	.64	65⅓°	77°	52°	69°	5	
24	5.49	1.27	43.70	47.29	2.25	1.66	.59	67°	79°	51°	69⅔°	0	
25	4.99	1.33	43.80	47.84	2.04	1.60	.44	68°	81°	59°	70°	6	
26	5.42	1.39	43.67	47.48	2.04	1.60	.44	71⅔°	83°	59°	73°	30	
27	6.02	1.34	44.26	46.29	2.09	1.58	.51	74⅓°	83°	61°	74⅓°	45	
28	6.21	1.23	44.85	45.80	1.91	1.57	.34	76°	84°	62°	74⅓°	25	
29	5.68	1.19	45.38	45.96	1.84	1.42	.42	78⅓°	83°	65°	74⅓°	40	
30	5.15	1.26	45.34	46.48	1.77	1.42	.35	73⅓°	83°	57°	74⅓°	35	.03
31	5.14	1.23	45.88	45.88	1.87	1.42	.45	71⅔°	82°	64°	75⅔°	30	
32	5.49	1.17	45.60	45.82	1.92	1.40	.52	68⅓°	85°	45°	73⅔°	10	
33	5.55	1.17	44.98	46.51	1.79	1.57	.22	60⅔°	72°	47°	71⅓°	75	
34	5.46	1.17	45.75	45.76	1.86	1.66	.20	66°	78°	53°	71⅓°	25	
35	6.46	1.22	45.17	45.30	1.85	1.60	.25	67⅓°	79°	63°	73⅔°	15	
36	6.20	1.20	45.31	45.52	1.77	1.64	.13	72⅓°	82°	62°	74⅔°	55	.01
37	6.19	1.16	46.96	43.97	1.72	1.60	.12	74°	86°	55°	76°	15	
38	5.78	1.11	46.75	44.59	1.77	1.60	.17	74⅓°	86°	64°	77⅓°	18	
39	6.17	1.06	46.71	44.21	1.85	1.64	.21	78°	90°	62°	79⅔°	20	
40	6.15	1.07	46.30	44.71	1.77	1.65	.12	78⅔°	92°	67°	80⅓°	40	
41	6.39	1.06	46.46	44.32	1.77	1.65	.12	83°	92°	67°	82⅓°	30	
42	6.71	1.07	47.03	43.48	1.71	1.58	.13	83⅓°	93°	73°	81⅔°	15	
43	6.08	1.13	48.03	42.99	1.77	1.64	.13	83°	95°	71°	82⅓°	20	
44	6.19	1.05	47.22	43.77	1.77	1.64	.13	78°	91°	72°	82°	50	
45	5.70	1.10	46.27	45.17	1.76	1.64	.12	80⅓°	90°	69°	83°	25	* .90
46	4.80	1.12	48.21	44.12	1.75	1.64	.11	64⅓°	77°	52°	71°	80	* .10
Total rainfall													4.53

* Thunder storms.

DIAGRAM OF RESULTS OF ANALYSIS OF CLAWSON WHEAT AT 46 SUCCESSIVE CUTTINGS. 1

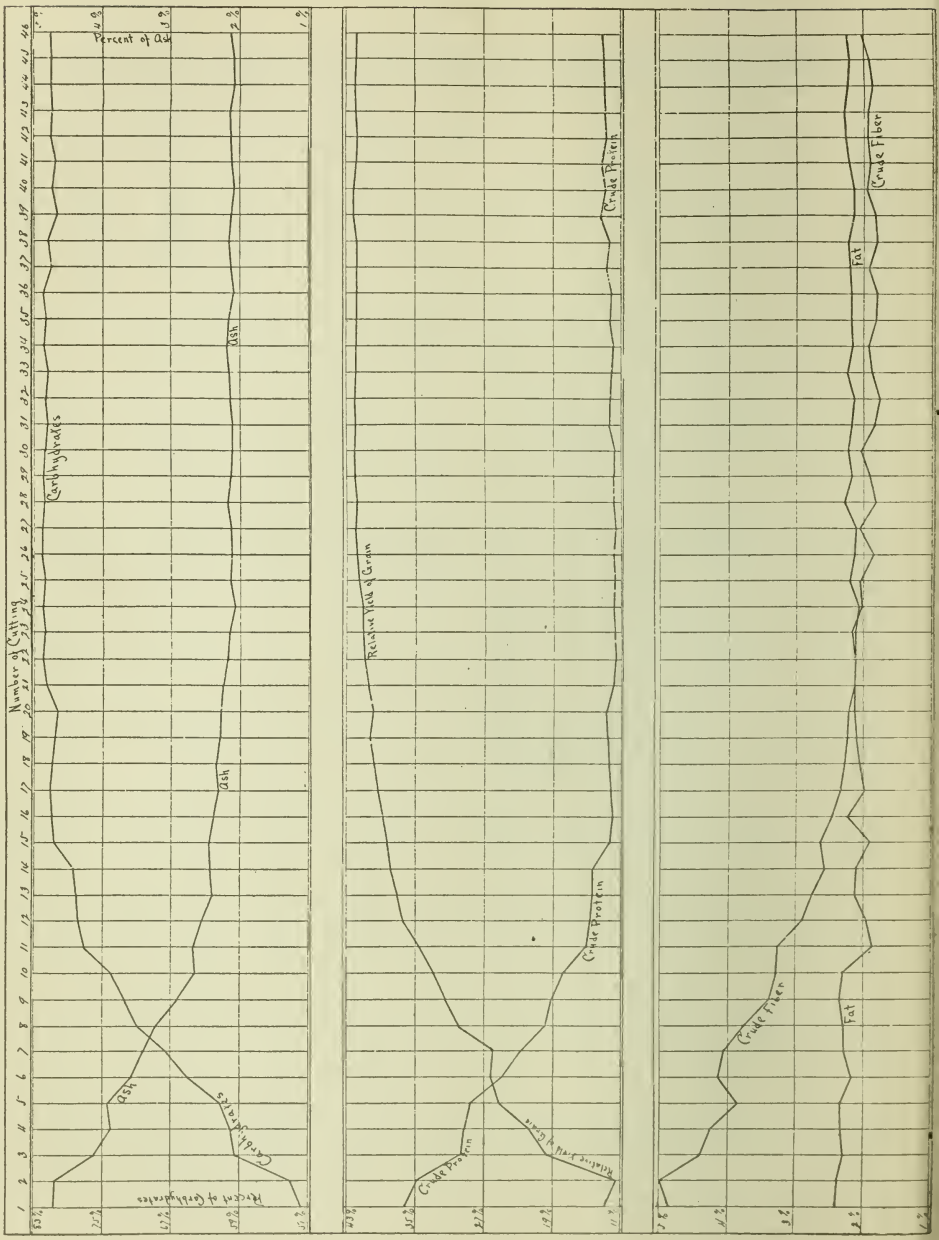


DIAGRAM OF RESULTS OF ANALYSIS OF WHEAT STRAW AT 46 SUCCESSIVE CUTTINGS. II

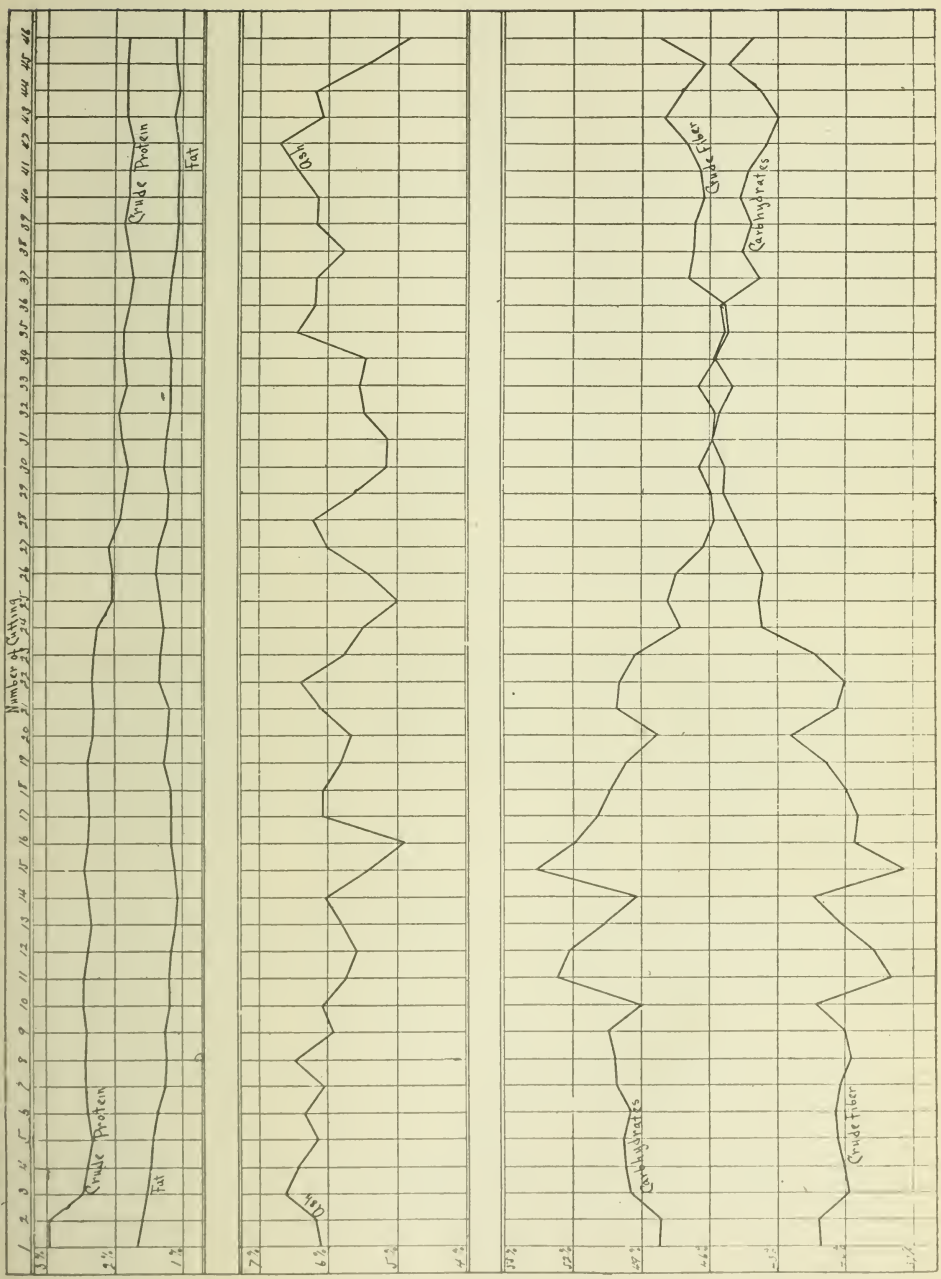
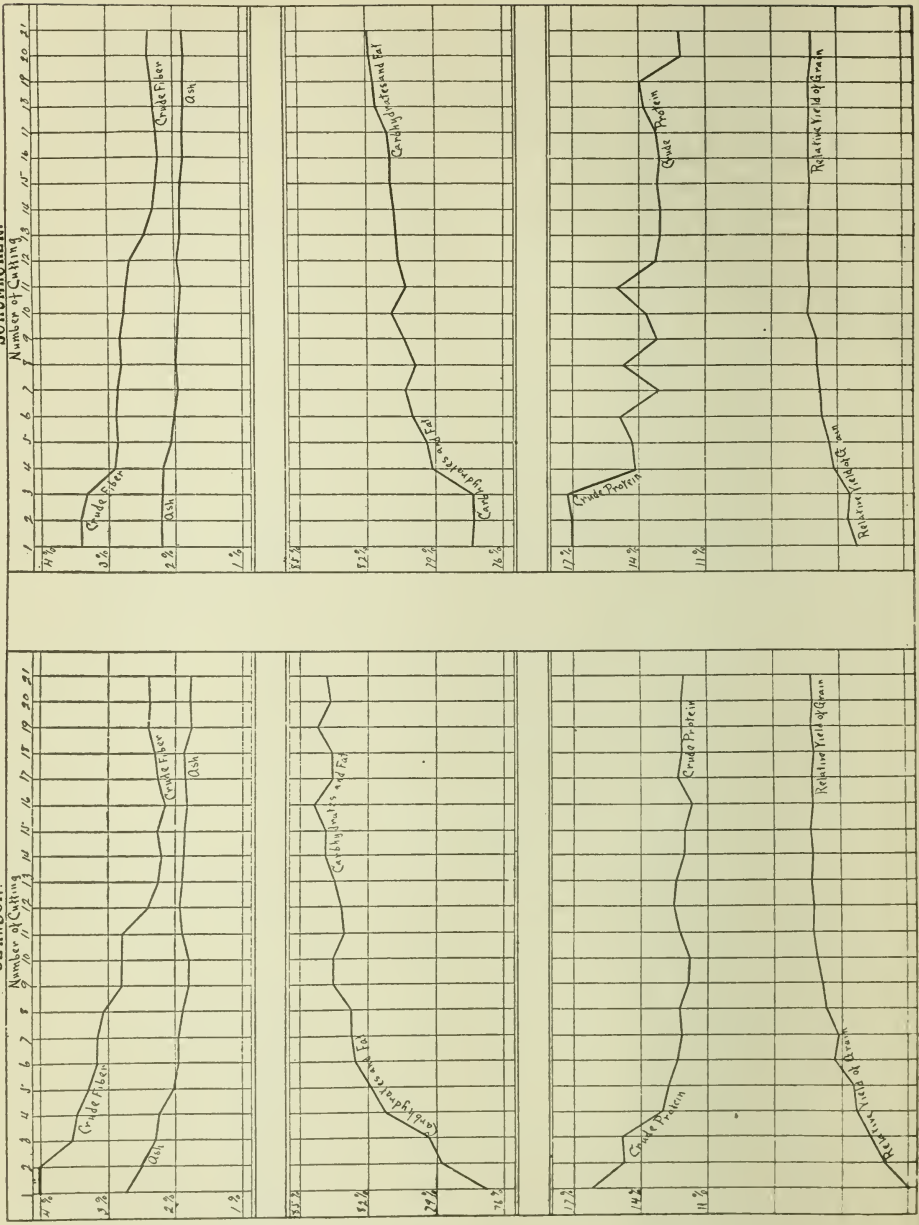


DIAGRAM OF RESULTS OF ANALYSIS OF WHEATS GROWN IN 1879. III



In Tables I and II are given the results of analysis, with other data bearing on the subject. The results are calculated for *dry substance* in both tables to admit of more complete comparison in regard to essential changes in plant composition. The tables are on opposing faces of the bulletin to facilitate comparison.

DIAGRAMS.

In order to take in at a glance the successive changes in the growth of the plant, the results are given in diagrams so that the salient points in this investigation may be grasped without the necessity of keeping in mind a long array of tabular figures.

I. *The diagram of results of analysis of Clawson wheat at 46 successive cuttings*, requires a few words of explanation. With materials varying so widely as "fat" and "carbhydrates" it would be impossible to get all the materials on a diagram to one scale, and have all equally visible. Three scales are used for distinctness: the upper one for "carbhydrates," with the percentage scale at the left—from 51 to 83%, and "ash" with scale at the right—from 1 to 5%; the middle one for "crude protein" with scale at the left—from 11 to 43% and "relative yield of grain"—the greater the yield for the smaller number of kernels to weigh ten grams; in the lowest scale the "crude fibre" and "fat" are presented on the scale of 1 to 5%.

II. In the *Diagram of results of analysis of wheat straw at 46 successive cuttings*, a corresponding adjustment of vertical space for representation of percentages is made for each of the leading components of the straw, the percentage scale being found at the left.

III. A third *Diagram of results of analysis of wheats grown in 1879* is introduced for comparison with the results obtained from the wheat of 1892. In the Clawson and the Schumacher wheats of 1879, the period of development at the beginning of the cuttings was much more advanced than in the Clawson of 1892, and there was less climatic disturbance during the season of growth.

DEFINITION OF TERMS.

Before proceeding to the discussion of the results of analysis given in the tables, it may be proper to define some of the terms used in the tables.

Ash is the mineral matter remaining when the organic substance is completely burned with free access of air. It is the source of the mineral matter for bones, etc., of the animal system.

Ether-extract is the material dissolved out of the grain or straw by common "sulphuric ether." It is entered in the Diagrams as *fat*. It consists principally of fat, but contains a small amount of wax, coloring matter, etc.

Crude fibre is the woody part of the plant, insoluble in weak solutions of acids and alkalies at boiling heat. While a portion of crude fibre is digestible, it is the least valuable part of the plant. The crude fibre of the older parts of plants is nearly indigestible.

N-Free extract represents the carbonaceous part of food which is free of nitrogen. It consists largely of starch, sugar, gum, etc., and is considered of value equal to starch. It forms the largest part of vegetable foods and fodders. It is entered as carbhydrates in the diagrams

Crude protein. It was formerly supposed that all the nitrogen in food material existed in the form of protein or albumenoids—substances resembling albumen. But it was found that some of the organic nitrogen existed in a less highly organized form than the albumenoids. Hence the term *crude protein* was used to include all the unoxidized nitrogenous compounds of fodders and forage plants.

Albuminoids are substances resembling albumen in composition and food value.

Amides are the parts of crude protein which are less organized than albumen, such as asparagin of the asparagus plant. The amides are of less value as food than the albuminoids, but their value is not definitely settled at present. They seem to be most abundant during the earlier stages of plant growth.

PROGRESS IN GROWTH OF THE WHEAT BERRY.

With these definitions in mind a glance at Diagram I will enable a person to see the progressive development of the wheat grain from day to day, the relation of these changes to greatest food value and the time of maximum yield of grain; also the deterioration of the grain by overripening.

COMPOSITION OF WHEAT STRAW.

Wheat straw is of so little value in comparison with the grain that no consideration has been given to the straw in determining the best time for harvesting, yet an examination of Table II and Diagram II shows that in the earlier stages of growth the straw compares favorably with hay; but at later stages of growth its value diminishes rapidly, especially when we remember that the old and consolidated crude fibre is less digestible.

Attention is directed to the changes in cuttings 1 to 22 as shown in Table II and Diagram II. The fat falls off one-third of a per cent (even one-half per cent during the cold spell of 13th to 18th cuttings) the carbhydrates increase nearly two per cent, the crude protein falling off two-thirds of one per cent.

At the 22d cutting the straw compares favorably with the earlier cuttings in food value for stock. This is the time when the "wheat is in the dough" and the grain ripened perfectly after cutting. The grain is ripe at this stage, or when the kernel will "crush dry" and leave no watery stain when crushed between the thumb nails. From this period onward there is a progressive degradation both of the grain and of the straw. There is a falling off in fat, carbhydrates and protein in the straw and an increase of woody fibre with decreasing digestibility.

It is a matter of common observation with farmers that stock would not eat the dead ripe straw as readily as they would the brighter straw of earlier cuttings. We see the sufficient reason for this lack of relish in the fact that the straw is poor in chemical composition and less easy of digestion. The interesting fact also appears that if the crop is harvested as soon as the grain is fully matured there is little loss of feeding value in the straw. While the grain gains nothing by dead-ripening, the straw rapidly loses value by overripening.

II. CERTAIN FORAGE PLANTS.

The experiment station was established in 1888. One of the first subjects to which attention was directed under the able leadership of Director Willets was the Jack Pine plains of the north-central part of our peninsula. The fact that the State held some 2,000,000 acres of these apparently worthless lands made the subject one of importance to our people, and the fact that the College held some 40,000 acres of the same lands as part of its endowment fund, gave additional interest to the problem of the plains.

In the outset it was proposed to find what these lands were capable of doing under the influence of a large variety of plants. For this purpose a large number of plants were sown, not with the expectation that all of them would succeed, but to meet in advance the criticism of those who would object that such and such a plant had not been tried. To settle the matter at the outset that certain plants would fail might save a large amount of subsequent inquiry and experimenting. It is not a valid criticism to say that many plants were tried that did not succeed. A decisive negative is often a valuable part of an experiment.

SPURRY.

Among the plants tried on the experimental farm at Grayling was spurry. Through the house of J. M. Thorburn & Co. of New York, I imported the seeds of spurry from Vilmorin Andrieux & Co. of Paris, and the first sowing of spurry in this State, if not in this country, was at Grayling.

In the light sands of the plains it has proved such a success that it has been difficult to supply the demand for the seed in the Jack Pine district, but it is rapidly spreading in that region, and gives great satisfaction wherever tried. A word of caution is needed for rich soils, *because the spurry forms seeds so rapidly and scatters them so freely that there is danger of its becoming a troublesome weed in rich soils.* But on light sands where few plants grow with vigor, a thrifty and rapidly growing weed is a godsend.

HOW TO GET SPURRY SEED.

To save correspondence, I may say that the College has no spurry seed to sell or to give away. Some seed can probably be obtained of Dr. Palmer of Grayling. I have also made arrangements with J. M. Thorburn & Co., 15 John St., New York, who will send by mail to any address a pound of spurry seed on receipt of 28 cents. A pound is enough for a trial and if it succeeds you can soon raise enough seed for your own use.

The value of some of the grasses and of spurry is set forth in the following letter to the Director of the experiment station by Dr. Palmer of Grayling, who has from the first taken a lively and intelligent interest in these experiments:

Grayling, Mich., Sept. 6, 1893.

Prest. L. G. Gorton, Director Experiment Station:

DEAR SIR—Your inquiry in regard to the success of the experiment station here can not be fully answered in a letter, but of the grasses which have proved successful in these light burned soils I mention Red Fescue,

Sheep's Fescue, Tall Meadow Oat Grass and Orchard Grass. The Fescues are slow of growth but make a very even sward, and excellent pasturage when established, and fill the earth with roots which promise excellent results as fertilizers for future crops. They do not cut a heavy growth of hay and must be cut early, or it is woody. The Tall Meadow Oat Grass must be sown very thickly on this soil; it grows very even over four feet in height and makes number one hay. The Orchard Grass is more inclined to be *bunchy*, but it is a rank grower, and mixed with the Oat Grass adds materially to the meadow. All these grasses were introduced here by Dr. R. C. Kedzie, professor of chemistry in the Agricultural College, while he had charge of the station, and no grass since introduced has proven of equal value.

But far beyond all of these, for both forage and manurial value, is spurry — a plant also introduced by Dr. Kedzie, who had known something of its value in Germany and other parts of the old world. He imported seed the first year of the station's life, and it has proved of so great value that its use has been continued by his successor, as Director of the station. On the lightest soil it has given a uniform, even growth, and on a little better soil has yielded a ton and a half of cured forage which was greedily eaten by horses, cattle and sheep in preference to the finest clover or timothy hay, while as pasturage it has proven most valuable for milch cows and for sheep. Its quick growth, maturing in 60 days with favorable showers, makes it very desirable, as it can be grown and plowed under for manure for other crops the same year, while it stands drouth better than any of the grasses, and I believe it to be fully equal to a full crop of clover which would take two years to mature. The introduction of this plant by Prof. Kedzie will alone be of more benefit to Michigan in reclaiming the plains or Jack Pine lands than the entire cost of the station to this time.

I could "sing its praises" all day, but the above statements will give you an idea of my opinion, and when we meet I'll tell the rest.

Very respectfully,

O. Palmer.

Specimens of spurry were received from Dr. Palmer the first of September for analysis, which were a foot high. The climatic conditions under which it was grown are briefly told in the following extract from the *Avalanche* of September 7, 1893, published at Grayling.

RAINFALL.

One can hardly imagine the extent of the drouth in this vicinity without an exact knowledge of the amount of rainfall, which is given below, as recorded by the observer for the government: April, .92 inches; May, 1.45; June, .91; July, 2.07; August, .95; total, 6.30 inches. Besides the lack of rain, remember that it froze 26 nights in April, and eight during the first half of May, with very high winds for both months, which sucked the little moisture there was from the surface, and the only wonder is that there is any vegetable life left, yet corn is good and potatoes a fair crop. grain and grass suffering most from the abnormal condition.

Under such conditions of cold, drouth, and high winds, that a plant should produce on a light soil and in less than four months a forage crop one foot high, shows a vigor of growth and a power to withstand adverse influences quite remarkable.

This spurry had matured a good crop of seeds which still remained in the boll. In the analysis to determine its food value it was considered fairest to take the entire plant, the seed with the stalks. A parcel was selected for this purpose, the roots cut away and the balance of the plant cut fine, dried and ground to fine powder for analysis. In this way the natural proportion of seeds and stalks was preserved in the ground product.

Analysis gave the following results:

ANALYSIS OF SPURRY.

	Per cent.
Moisture	5.39
Crude ash	9.62
Ether extract, fat, etc.	5.76
Crude fibre	57.10
N-free extract, starch, etc.	8.57
Crude protein	13.56
	100.00

The crude protein contains of albuminoids 10.19 per cent and amide compounds 3.37 per cent. It may be that a dry season has secured a condensation of the most highly developed food materials, but the amount of crude protein in the entire plant—about on a par with the leading grains used for stock feeding—explains why it is greedily "eaten by horses, cattle and sheep in preference to the finest clover or timothy hay, while as pasturage it has proven most valuable for milch cows and sheep." The large amount of albuminoides required by sheep to produce the growth of wool suggests the great value of spurry in sheep husbandry.

The report comes from Newaygo and vicinity that the spurry has proved a great disappointment, the crop not growing according to expectations. My information is too limited to afford an explanation, but it is probable that the seed was sown too early and the young plants were killed by spring frosts, as the young plant is very tender to frost. It should be sown after the time of severe spring frosts.

LATHYRUS SILVESTRIS: FLAT PEA.

The flat pea was introduced into Michigan by the former Director of Experiment Station. The history of the plant and of its introduction was given in Bulletin 91 and need not be repeated.

This member of the Vetch family gives promise of extraordinary value as a forage plant. It developes a large strong root, and the nitrogen-assimilating tubercles are very large and numerous, in excess of any plant known to me. The roots penetrate very deeply in porous soils and it promises to be a plant capable of withstanding drouth when once well established. The seed is very slow to germinate and as the plant seems to be little affected by the frost it is possible that very late fall sowing may be the best way to get the plant started.

Dr. Palmer at Grayling writes that the "Lathyrus has withstood the drouth and made fine root growth but small top. It is entirely without manure except a light dressing of leached ashes and not much can be expected."

On the College experimental grounds this year the two year old plants have made a very large growth, the stalks being three feet long on July 13.

A selected and measured square rod was cut July 12 and the green mass weighed, yielding at the rate of 16 tons per acre; dried and thoroughly cured it made 4 tons per acre of hay. This is not the most satisfactory way of determining the hay making capacity of a crop but it is submitted for what it is worth.

Some of the Lathyrus was cut on July 4 at which time it was in full bloom. The sample was analyzed and the results are here submitted. The analysis was conducted according to the "official method" and was carried on in duplicate giving concordant results, and the analysis has since been repeated. The results of analysis are surprising but no source of error is apparent.

ANALYSIS OF LATHYRUS SILVESTRIS.

	Per cent.
Moisture	7.99
Crude ash	8.32
Ether extract, fat, etc.	2.08
Crude fibre, woody matter	26.70
N-free extract, starch, sugar, etc.	27.74
Crude protein	27.17
	100.00

Of the crude protein the albuminoids constitute 14.36 per cent while the amide compounds form 12.81 per cent.

Analysis of a sample cut July 13 gives 25 per cent of crude protein.

If we fix our attention only upon the true albuminoids, showing more than 14 per cent in the air dry hay, we recognize the remarkable feeding qualities of this remarkable hay.

Inquiry has been made for seeds of the Lathyrus silvestris. The College has none for sale. A letter from J. M. Thorburn & Co., No. 15 John St., New York informs me that they will furnish imported seed for $2.25 a pound.

PEPPERMINT HAY.

In the southern part of our State large crops of peppermint are raised for making peppermint oil. The residue after the oil is distilled is dried and makes "mint hay," which is readily consumed by stock. While it will not make any large part of the hay crop of our State, its chemical composition may be of some interest. Mr. C. C. Pashby, a student from St. Joseph county, brought a sample of mint hay to the college for analysis, which gives the following results:

ANALYSIS OF MINT HAY.

	Per cent.
Moisture	11.40
Crude ash	6.04
Ether extract—fat, etc.	1.80
Crude fibre—woody matter	35.47
N-free extract—starch, sugar, etc.	36 73
Crude protein	9.56
	100.00

The crude protein contains 8.12% of albumenoids and 1.44% amide compounds.

III. ADULTERATION OF GROUND FEED.

Complaints came to this laboratory from teamsters and draymen, that the chops or ground feed did not keep their horses in as good condition for work as formerly, and the chemical department was asked to find out the cause. Some of the ground feed was examined and appeared to be very rich in oats because of the abundance of the oat hulls in the chops. Equal measures of oats and corn were ground together to make the favorite mixture, and when this was compared with commercial chops, it seemed deficient in the oat element, the oat hulls being more abundant in the commercial article. In reality the chops had much less oats, the apparent richness in oats being the result of grinding a large amount of *oat hulls* with corn. Oat hulls accumulate in large quantities at the mills where oat meal, rolled oats, etc., are prepared, the real grain being separated as oat meal, etc., and the chaffy and nearly worthless hulls become an incumbrance until the happy thought occurred to some feed-mixer to grind them up with corn and make the popular "oats and corn chops."

To obtain more definite information on this subject, I wrote to a leading commission house for grain and feed, and obtained the following answer:

"DEAR DOCTOR:—

"Received your favor of 14th inst. and hasten to reply. Sorry to learn that you are on the track of millers who are using oat hulls and corn hulls (or corn bran as we term it), for the road is a broad one, and you will have a large territory to cover, and plenty of work to do if you catch all the rascals, as we all (or nearly all) use them. I send you a sample of oat hulls, such as I have used and as nearly all feed mills in the country do use; also sample of corn bran and a small sample of gluten feed. These are mixed with corn, screenings, barley, malt-sprouts and various other products that can be used and mixed in grinding to make chops. Also send you a sample of chopped feed as being sold here. Prices of hulls vary according to demand of feed, from $1.75 per ton to $8.00 per ton, F. O. B. shipping points, with various rates to New York and other points. Corn bran is worth $18.00 per ton at present, Boston points. Have bought it from $5.00 to $6.00 per ton less during the summer.

"No use to give names of millers as nearly every feed mill in the country is in the habit of using them or other cheap articles for grinding. Don't know as you could now call it a fraud, as it is generally known that such stock is used, and purchasers buying cheap grades of feed know what it is made from as the price gives it away.

"Any further information required on your part will be gladly furnished if possible, but remember that I am getting bread and butter out of oat hulls."

The guarantee of the quality of the feed from the price of the retailer will hardly satisfy the teamster, still less the team. If the horse only had a vote on this question!

ANALYSIS OF ADULTERANTS.

The oat hulls and corn bran have been analyzed and the results of analysis given. For comparison the analysis of oat straw is placed side by side with oat hulls:

	Oat hulls.	Oat straw.	Corn bran.
Moisture	6.12	14.30	7.70
Ash	4.37	4.40	1.55
Fat	.54	2.00	10.65
Crude fibre	35.87	39.70	14.34
Carbhydrates	51.73	35.60	57.64
Crude protein	1 37	4.00	8.12

The composition of oat straw is the average of a number of analyses, taken from Armsby's Cattle Feeding. From this table it is seen that the oat hulls, with the exception of carbhydrates (starch, gum, etc.), is of *less value than oat straw*, having only about one-quarter of the fat and one-third of the protein or albuminous materials. On the other hand oat meal contains more than 17 per cent of protein, 6 per cent of fat, and 64 per cent of carbhydrates. The meal contains all that is of material value, and the chops where the whole of the oats is the oat hulls is poor fodder for working horses.

I have no remedy to propose for excluding such chops from the market. The best remedy is an enlightened public opinion, and the best cure for a fraud is to show that it is a fraud. Specimens of these adulterants are kept at the chemical laboratory and can be seen by any one interested in this subject.

GLUTEN FEED.

Another material which may become important in forming a food ration for stock is "*gluten feed*," the albuminous residue of corn in making starch. This is not the "gluten meal" so widely exploited in this State last spring by an agent of the Buffalo works. "Gluten feed" is too rich to feed alone, but would make a valuable addition to fodders too poor in fat and protein.

ANALYSIS OF GLUTEN FEED.

	Per cent.
Moisture	7.12
Ash	.85
Fat	6.45
Crude fibre	1.45
Carbhydrates	47.67
Crude protein	36.37
	100.

Almost the entire amount of crude protein is in the form of albuminoid —36 per cent—while only .37 of one per cent is in form of amide compounds. The great value of gluten feed as an ingredient of stock feed is evident from an inspection of the above table.

IV. MINERAL RESIDUES IN SPRAYED FRUIT.

The practice of spraying fruits with certain mineral compounds to destroy insects and fungi has called out discussion in regard to the ripened fruit after such spraying, and its fitness for food. The subject has awakened an earnest discussion and many wild statements have been made on both sides of the subject. The first condition for intelligent discussion of any subject is to know the facts in the case.

The Horticultural department in 1892 and again in 1893 sent to the Chemical department specimens of fruit for analysis which had been sprayed during the season of growth, with a careful statement of the composition of the mixture used in spraying, the quantity used and the dates of application.

Two kinds of spraying mixtures were used. No. 1 consisted of 1 lb London purple in 200 gallons of water; and 6 lb of $CuSO_4$, $5H_2O$ (crystallized sulphate of copper) and 4 lb of lime in 32 gallons of water, the spraying mixture (unless otherwise stated) consisting of equal measures of the London purple and the Bordeaux compound. The No. 2 spraying mixture differed only in the use of 2 lb of the copper salt and 1½ lb of lime for 32 gallons of water with an equal measure of the London purple mixture.

In stating the results of analysis the calculation is made on the basis of one pound avoirdupois of fruit, and the metals found in a pound stated in grains; the "arsenic" as white arsenic (As_2O_3) and the "copper salt" as blue vitriol ($CuSO_4$, $5H_2O$).

RESULTS IN 1892.

Strawberries No. 1. Sprayed with No. 1 mixture June 18 and 23, one-half gallon on one rod of row. Picked June 24. Fruit excessively sprayed, the berries nearly covered with the mixture.

Arsenic found ..... .044 grains
Copper salt ..... 4.87 "

Strawberries No. 2. Sprayed June 18 and 23 with No. 2 mixture, one-half gallon to rod of row. Picked June 24. Excessively sprayed.

Arsenic found ..... .0298 grains
Copper salt ..... 1.821 "

Red Cherries No. 1. Sprayed June 18 and 30 with No. 1 mixture, one gallon to a tree. Picked July 6.

Arsenic found ..... .0882 grains
Copper salt ..... .390 "

Red Cherries No. 2. Sprayed June 18 and 30 with No. 2 mixture, one gallon to a tree. Picked July 6.

Arsenic found ..... .025 grains
Copper salt ..... .252 "

White Cherries. Sprayed June 30 with No. 1 mixture, one gallon to a tree. Picked July 1.

Arsenic found ..... .121 grains
Copper salt not estimated.

Red Currants. Sprayed with London purple solution May 25, June 7, 18 and 30, one gallon to one rod of the row the first and second times and three-fourths of a gallon the third and fourth times. Picked July 8.

Arsenic found ..... .0503 grains

Raspberries. Sprayed with No. 2 mixture June 6 and 28 and July 8. Picked July 20.

Arsenic found ..... .0098 grains
Copper salt ..... .028 "

Gooseberries No. 1. Sprayed with No. 1 mixture June 18 and 29, July 8 and 22, one-half gallon to a row two rods long. Picked August 2.

The fruit was first washed with 10 per cent Hydrochloric acid to dissolve off the visible remains of spraying and the acid washings and washed fruit separately analyzed.

Arsenic in acid washings ..... .0186 grains
Copper salt ..... .463 "
Washed fruit:
Arsenic found ..... .0047 "
Copper salt ..... .138 "
Total residue found on and within the fruit:
Arsenic ..... .0233 "
Copper salt ..... .601 "

Gooseberries No. 2. Sprayed June 18 and 29, July 8 and 22 with mixture No. I, ½ gallon to two rods of row. Picked August 2.

Fruit washed with acid the same as the preceding specimen.

Arsenic found in acid washings ..... .0207 grains
Copper salt ..... .212 "
Washed fruit:
Arsenic found ..... .0165 grains
Copper salt ..... .150 "
Total residue found on and within the fruit:
Arsenic ..... .0372 grains
Copper salt ..... .362 "

Pears. Sprayed June 15, July 7 and 21, and August 7 with mixture No. I. Picked September 6.

Arsenic found ..... .0088 grains
Copper salt ..... .0738 "

RESULTS IN 1893.

In the experiments with tree-fruits this year the Bordeaux mixture of 2 lbs copper salt and 2 lbs lime to 32 gallons of water was used for spraying the fruits on the tree. The London purple was omitted.

Pears were sprayed May 15, June 12, and July 10. One pound of the fruit gave the equivalent of .100 grains of copper salt.

Russian cherries were sprayed with Bordeaux mixture May 14, June 10 and 18 and on July 15 with modified eau celeste.

One pound of fruit contained .147 grains of copper salt.

Plums treated in the same way as Russian cherries, and at the same time, gave .2 grain of copper salt to a pound of fruit.

In these experiments extending through two years, the minerals used in spraying the fruits were found in appreciable quantities in every instance, though the amount was small in all cases except when the spraying had been purposely excessive.

The inquiry naturally arises whether these poisons merely adhere to the surface or penetrate the substance of the fruit? The results with gooseberries seem to show that they penetrate the body of the fruit to a limited extent. A test of this question has been made with some of the sprayed pears. A pound of the pears was selected, the skin carefully pared off and burned by itself, and the body of the pear burned to ashes by itself and each ash separately analyzed. The pear pealings from 1 pound of pears gave .106 grains of copper salt, and the flesh gave .071 grains, showing that while most of the copper salt adheres to the surface, a portion finds way into the body of the fruits.

The copper salts adhere to vegetable surfaces more persistently than is commonly supposed. A student in chemical analysis (W. F. Wight), during the first week in May, 1893, made some investigations on this subject. The outside bark of trees that had been sprayed with Bordeaux mixture was gathered, burned to ash, which was dissolved in nitric acid and the copper plated out on a platinum dish and weighed. The results are calculated for 100 square inches of bark surface. The bark of a tree that was sprayed April 18, 1893, gave .124 grains of metallic copper. The bark of a tree more recently sprayed, and on which the spray was still visible, gave .28 grains of copper. The bark of an apple tree sprayed about one year before gave .05 grains, and the bark of a plum tree sprayed about June 1, 1892, gave .044 grains of copper.

The suggestion has been made that an opinion in regard to the safety in the use of such sprayed fruits as food would not be out of place. The condition where the poisons are applied directly to the fruit a short time before ripening is quite different from that where the poison is applied to one part of the plant while an entirely different part is used for food, such as the application of Paris green to potato vines to kill the Colorado beetle. So also the spraying of the young apples with Paris green soon after the blossoms have separated in order to destroy the larva of the coddling moth is quite different from spraying the developed and ripening fruit. The persistence with which such poisons adhere to the bark and other surfaces as shown in preceding experiments is quite significant.

The use of poisons in horticulture in my opinion is largely in excess of the amount required for a fungicide. One-half or even one-third of the amount usually employed would probably give as good results.

In the spraying of some fruits, such as strawberries in 1892, the amount was purposely used in large excess. In one case nearly five grains of blue vitriol were recovered from one pound of fruit—a dose no sensible person would want to take in his food. Yet even that dose would not probably be fatal, though it might cause vomiting. Any of the doses of arsenic or of copper found in a pound of these fruits might be swallowed without endangering life by such single dose. It is the repeated doses, day by day, of such poisons that might produce slow poisoning and the gradual undermining of the health without obvious cause. It is safe to refuse all fruits which have been sprayed with these poisons (especially arsenic) during the period of ripening.

For a large part of the analytical work which forms the basis of this bulletin I am indebted to my assistants, W. L. Rossman and H. E. Harrison. I am fortunate in having such able and faithful helpers.

AGRICULTURAL COLLEGE,
September, 1893.

R. C. KEDZIE.

BULLETIN 102.

CELERY INSECTS.

ENTOMOLOGICAL DEPARTMENT.

Michigan is peculiarly a celery state. It no doubt has enough swamp lands, of the peculiar muck soil, so requisite to the best success in celery culture, to supply the whole country, and certainly will make use of them largely for this appetizing plant in the near future. Every year brings an increased acreage. When celery was first introduced and raised only in limited areas, no insect attacks were ever reported, and probably none occurred, as an introduced plant is seldom attacked for several years. As several species acquired a liking for it, occasional reports of injury would be received. The past two or three years, the species that attack celery have so greatly increased in numbers and severity that the calls demanded a more extended knowledge which would assist both professional and amateur celery growers to keep these little depredators in check by means of the best remedies that could be suggested. So far as can be ascertained, only two species have been reported in economic literature as celery insects.

But little celery is grown at the college, and what has been learned has been largely by frequent visits to the extensive fields at Kalamazoo, Tecumseh, and Jackson, and through correspondence with some of the most intelligent growers at these places. More might have been learned could the fields and myself have been in closer proximity, but the most destructive species are briefly described, illustrated, and remedies given. Many are spoken of that are not numerous at present but may be in the seasons following.

I wish to express my thanks to the members of the Board and the Directors of the station for their generosity and assistance in making this bulletin what it is, and to Mr. Russell of Tecumseh, and Mr. Wilson of Kalamazoo, and the many other celery growers at the various places visited, for their ever ready assistance in the field work. I am also very

grateful to Mr. VanDuzee, Prof. Fernald, Prof. Osborn, Prof. Williams, the department at Washington, D. C., Profs. Cook and Wheeler of this college, and others who have so kindly assisted me in determining the various material gathered.

LOCUSTS AND GRASSHOPPERS.*

Owing to favorable seasons last year and this for grasshoppers and locusts, they have been very numerous and made their work felt on various plants—celery being one of the number. Those celery fields that have been surrounded mostly by high meadows, grain fields, forest or pasture lands, have suffered the most severely. It is on the drier, more sandy land that they are the most numerous early in the season, and then, as vegetation in these places becomes dry and partly dead, they avail themselves of the fresh and green fields of celery in the low lands. They will never be found on the low lands in numbers except in dry weather when they are driven from the uplands by a scarcity of food. The eggs are laid on sandy knolls or the mellower parts of the uplands, and here the young hatch and attain considerable of their growth before they travel any distance.

If the fields where the hoppers breed could be plowed and thoroughly rolled in the fall, and kept under cultivation the following season, the hoppers would probably be considerably reduced in numbers. The roller is especially important as it is found that rolling crushes so many of the frail egg cases.

THE MOST DESTRUCTIVE SPECIES.

Fig. 1. The red-legged locust, *Melanoplus femur-rubrum*—(after Riley.)

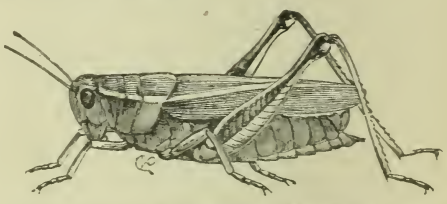


Fig. 2. The two-stripped locust, *Melanoplus femoratus*—(after Riley.)

The species most frequently found and found in the greatest numbers was the common red-legged locust, *Melanoplus femur-rubrum* (Fig. 1). While no special study of the species on celery was made, it was evident that those common in meadow and pasture lands were proportionately common in celery fields. They stripped the celery of its leaves along the border as readily as that of any forage plant. Some of the species besides the red-legged locust that were common are the two-striped locust, *Melanoplus femoratus* (Fig. 2), and *Dissosteria carolina*. Of the common meadow grasshoppers, *Orchelimum vulgare*, *Xiphidiumfasciatum* and *X. strictum*, and the katydid, *Scudderia furculata* (?) were plentiful.

REMEDIES.

A very good preventive, in one instance at least, that came under my observation while in one of the fields, was to leave a strip of land about

* The term *locust* is applied in its more restricted sense to the brown hoppers with short horn-like antennæ, or feelers, and *grasshopper*, to the green hoppers with long thread-like antennæ, and will be so used in this bulletin.

four rods wide without plant growth. The instance cited was a strip used in the spring for a plant bed. It was along the end of a field next to a pasture field. The plants had all been taken up and transplanted in other parts of the field and the strip left idle until used for a late crop of celery. The locusts were plentiful along the border, but only a few wandered in far enough to reach the celery, while the other borders were suffering from locust invasions. The disuse of so large a strip of land makes this method of prevention rather expensive unless the surrounding land is of little value. The surrounding of the fields with ditches partly filled with water, although reported as effectual, is also quite an expensive outlay.

At my suggestion, Mr. Slater of Tipton tried sweetened bran with Paris green added, as suggested on page 4 in bulletin 98. He reports that he had no trouble in getting the hoppers to eat it, but was unable to tell whether it killed them or not. From some experiments conducted by myself there seems to be no doubt but that they are killed and quite quickly. The locusts were placed in three lots of which one was fed on molasses and bran with enough Paris green added to give it a green tinge, another the same with strychnine instead and the third without poison. Inside of twenty-four hours those fed on the Paris green were all dead. At the same time only one of those given strychnine was dead, and all were lively and active in the unpoisoned case. It is quite probable that Paris green used in this way will prove very helpful in keeping the number of locusts diminished, but care must be taken that it is not used where fowls or stock can get at it.

What at present seems to be the most effectual means of thinning the numbers is a modification of the "hopper dozer" spoken of and illustrated in bulletin 98. This modification was devised and used by Mr. C. H. Hardy of Tipton and, from his trial of various remedies through the season, he feels that this method is superior to all others. He bought large flocks of turkeys and chickens hoping they would keep the locusts in check, but they trampled the plants and ate the plume of the older ones and did not diminish the number of locusts as much in a day as two men would in a few hours with his hopper collector. The accompanying cut shows

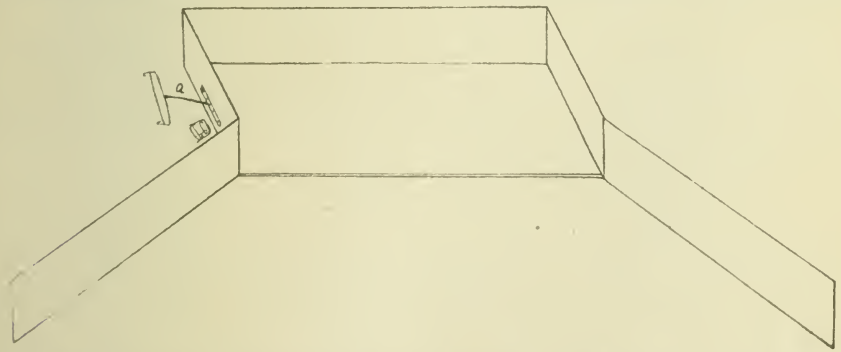


FIG. 3.—Modification of the "hopper dozer" as used by Mr. Hardy. *a*, Whiffletree attachment—(original).

the outline plan. The pan is made of sheet iron and is about 12 or 15 feet long by 4 to 6 wide. Then with a high fender on three sides and projecting wings from these and a whiffletree attachment at one end as at *a*, the mechanism is complete. The horse draws the pan to where it is to be set

on the grass at the border of the celery, then two men go into the celery and drive the locusts toward the pan. The two wings aid in crowding them into the center, and soon a large number of the hoppers are on the tar which has been previously coated over the inside of the pan. The collector is then driven up another space and the same operation repeated. Mr. Hardy used an old sugar pan with one side cut off and wings added. It is easier to collect the hoppers before their wings are fully developed, or in the cooler part of the day when they do not fly so readily. The regular hopper dozer is not practical in the celery fields as it must be raised so high to run over the plants without injuring them that the hoppers mostly go under the pan.

THE TRUE BUGS—ORDER HEMIPTERA.

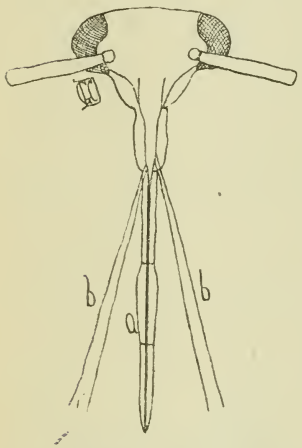


Fig. 4.—Head of the tarnished plant bug, showing the jointed beak, or rostrum, *a*, and the four needle-like mouth parts, *b*, used in piercing plants—(original).

This order of insects furnishes nearly one-half of the celery pests, and several of the most injurious ones that we have. They do not bite or chew, but puncture the plant and draw the sap through the puncture. They are all characterized by having a beak. In the accompanying cut, the head and beak of the tarnished plant bug are shown. The four needle-like parts work together in the groove inside the beak, and, after they have pierced the plant, the sap is sucked up through this groove into the stomach. The beak does not enter the plant, but only presses against it. In the very young stage of this tarnished plant bug, the whole operation showed more plainly than any before observed. The piercing needles entered the plant as rapidly and apparently as easily as one could push a pin into a cushion. As the needles passed on through the stalk, the jointed beak became telescoped till it was all in two joints and scarcely half the length it was at first. It is thought by many that these bugs injure the plants by secreting a poison when the sap is drawn. It is quite probable this may be so for the purpose of increasing the flow of sap. We all know of the mosquito poisoning for a similar purpose the puncture it makes.

LEAF HOPPERS.

All through the season, leaf hoppers were common on the celery. Early in the season they were especially abundant, usually flying ahead of one like a swarm of flies, as he passed through the field. When the plants are small, these leaf hoppers do a great deal of injury by sucking the sap from the plant through the thousands of little punctures that they make with their pointed, beak-like mouth parts (see 4a, plate I). While the plants, for the first few weeks after transplanting, are having their hardest struggle for existence, the little leaf hopper's work is the most destructive. This season many fields of celery were retarded in growth at this period. This is a part of the season when the celery grower can the least afford to allow any interruption in the growth of his plants.

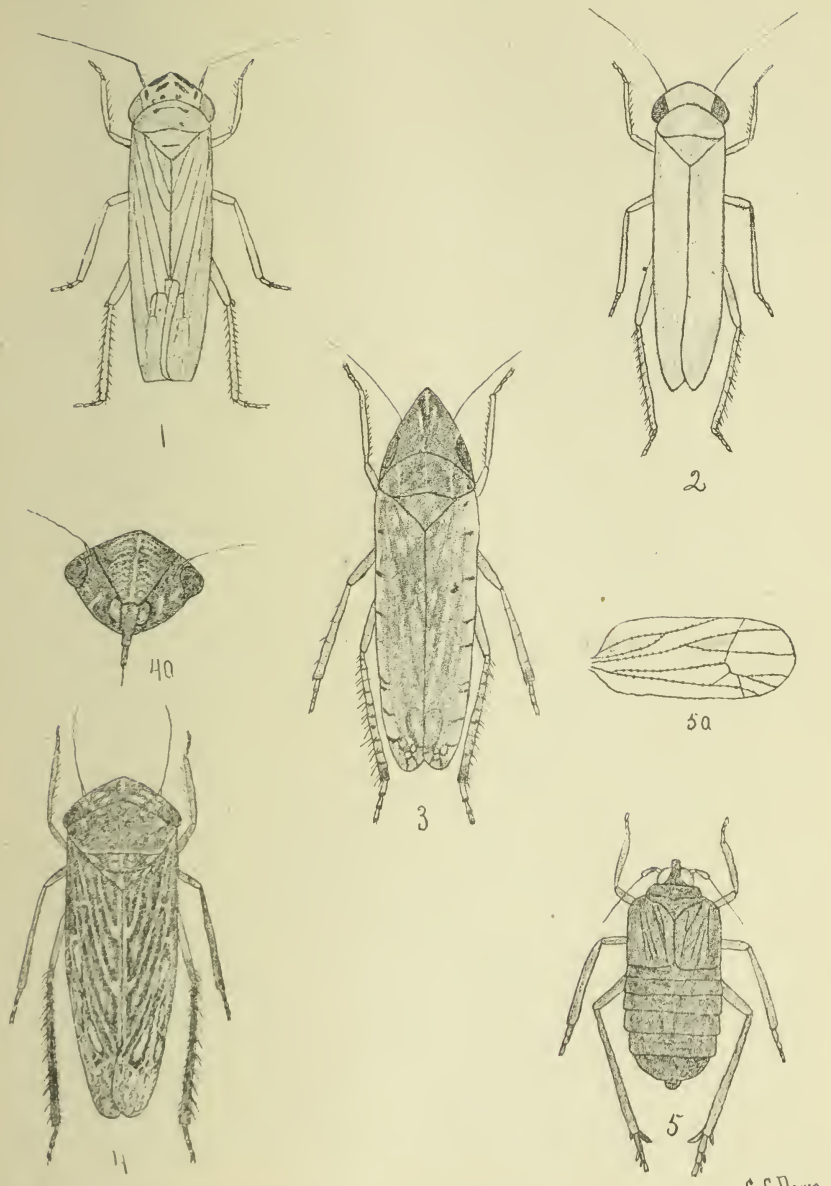


PLATE I.—Fig. 1, *Cicadula 4-lineata;* 2, *Empoasca mali;* 3, *Platymetopius acutus;* 4, *Athysanus instabilis* n. sp.; *a*, front view of the head showing clypeus, lora, cheeks and front; 5, *Megamelus piceus* n. sp.; *a*, complete wing of macropterous form. All drawn ten times the natural size.

SPECIES THAT WERE MOST NUMEROUS.

1. *Cicadula 4-lineata* Forbes (Fig. 1 of plate I) was the most common species everywhere. At the college and where the muck had considerable clay in it, they could be taken by the hundred at almost any time in the season. The species is greenish brown, with yellow scutellum, and head spotted as shown in the figure.

2. *Empoasca mali* Le B. (Fig. 2 of plate I). This is a pretty little yellow species with transparent greenish wing covers and green legs. It was very common through the season after July. At Kalamazoo many were found down in near the heart on blanching celery. It is probable that they help spot the white stalks. They breed on the plants.

3. *Platymetopius acutus* Say (Fig. 3 of plate I) was common the latter part of the season. The young were found on the plants early this fall. The species probably does little harm as it prefers to be high up on the leaves instead of on the stems. To the naked eye it is a dark brown and can be easily told by the acute projection of the head.

4. *Athysanus instabilis** n. sp., Van Duzee (Fig. 4 and 4*a* of plate I).

Form of *Deltocephalus inimicus* Say. Black, dotted and marked with fulvous as follows: hind edge of the vertex, a dot, sometimes wanting, touching this either side of the middle, another near each eye, two marks on the disc, a line before each of these, an angular mark at apex including a short longitudinal dash, a dot on the temples, six or eight arcs and the central line on the front, the latter expanded on the clypeal suture, two dots on the base of the clypeus, another on each lora, a spot on the cheeks and their slender outer edge, the irrorations of the pronotum and a few large spots on its anterior edge, six spots on the scutellum—four marginal and two discal—and its median line, knees, a transverse band on the femora and the slender hind edge of the abdominal segments. Posterior legs pale, more or less clouded with fuscous, with the inner face of the flattened tibia black. Elytra pale, slightly clouded at apex, the areoles broadly margined with fuscous, nervures whitish. Last ventral segment of the female long, feebly arquated either side of the middle, with the lateral angles prominent. Valve of the male short, plates triangular subacute. Length 4–4½ m. m.

Quite common at the college through August and September. Mr. Van Duzee has the specimens of the same species from Colorado also.

5. *Megamelus piceus* n. sp., Van Duzee (Fig. 5 and 5*a* plate I).

Piceous-black; base of the vertex, keels and narrow hind edge of the pronotum, disc of the mesonotum, or at least its carinæ, disc of the tergum, especially towards its base and apex, and the edge of the dorsal keel; the genital segments and sometimes the base of the venter, brownish yellow. Face pale shaded to brown above, clypeus deep black. Antennæ, rostrum, tylus, and legs pale, soiled yellow, the latter lineate with brown. Elytra reaching to the second abdominal segment in the branchypterous form, with the apex truncated, piceous-brown, or even black, with the apical edge white more or less broadly interrupted with black at the middle; nervures strong, granulated. In the macropterous form the elytra extend considerably beyond the tip of the abdomen about as in *Liburina pellucida;* they are smoky with pale granulated nervures, the exterior and interior of which are forked at about three-fourths their length. Pygafers of the male cylindrical, on their ventral aspect cut out for about one-half their length and carrying on the broad base of this incisure a broad and short projection extended into a short conical divergent tooth at each angle, beyond this are the incurved spine-like stylets included between the long slender ventral projections of the plates. Length, 2½ to 3 m. m.

New York and Michigan. Described from many examples of both sexes taken in western New York on grass in low swampy meadows in August and September, and one female taken on celery at Kalamazoo, Mich., August 26, 1893, by Mr. G. C. Davis.

In this species the vertex is shorter and broader, the pronotum shorter and the meso-

* This and the following species were found to be new to science and Mr. E. P. Van Duzee, a specialist on Jassidæ, to whom they were sent, has kindly consented to describe them. His same descriptions will also appear in the Canadian Entomologist.

notum longer with more divergent carinæ than in *M. notulus*. The yellowish markings above vary much in extent, some specimens being almost entirely of a dull piceous-black while some are pitchy brown with the pale markings much extended. The characters of the head, the pale face and the black vertex and clypeus seem quite constant as does also the color of the tylus, rostrum, legs and elytra.

Of the other species *Phelpsinus irroratus* Say and *Agallia sanguineolenta* were quite often taken; *Tettigonia noveboracensis*, *Thamnotettix clitellaria* *Deltocephalus melsheimeri* Fitch and *D. inimicus* Say, occasionally taken. No extensive collecting was done in getting this material. To secure specimens of those most common on celery rather than a complete list was the object.

REMEDY.

Owing to the fact that leaf hoppers do not feed by chewing the plant, but live on sap taken from the inside of the stem or leaf, most of our insecticides are of little avail. This being the condition and the hoppers so injurious to the young plants, another method was devised that has

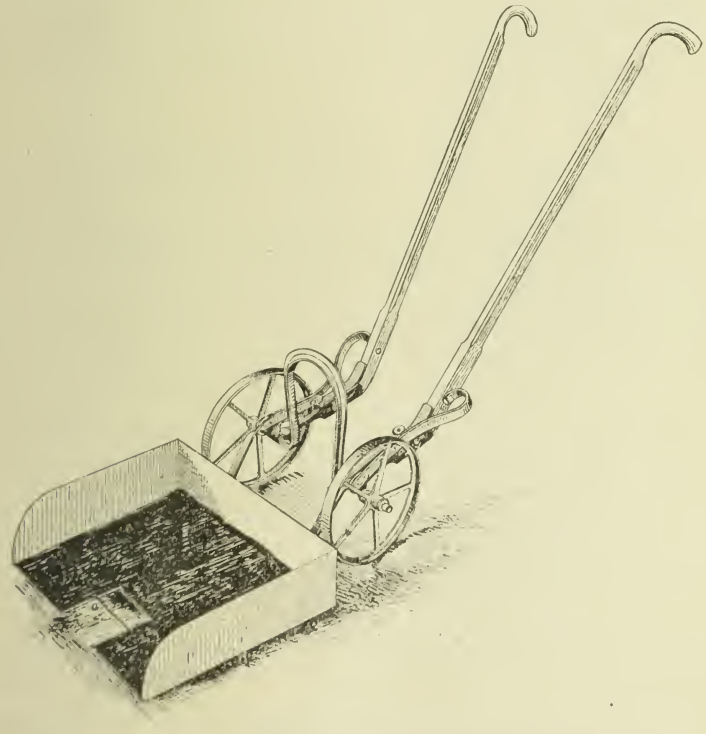


FIG. 5.—The hopperette used in collecting leaf hoppers, flea beetles and many of the celery bugs. *a*, string—(original).

succeeded even better than my first anticipation had predicted. It is by means of a small tarred pan attached to a hand wheel hoe as in Fig. 5. The pan is made of sheet iron. The bottom is 16x20 inches with a notch

six inches deep by four wide cut in the center of the front edge. On the two sides and back is an upright sheet about four inches high to prevent the leaf hoppers jumping over. The edges of the front side and notch are rolled up merely sufficiently to prevent the tar on the bottom from running off; one-eighth of an inch is ample. The hopperette, as we will designate this collecting pan, is attached to the wheel hoe by two strips of strap iron fastened under the pan as a support and at the other end bolted to the frame of the hoe or fastened in any way that will make it solid. The shaping of these braces and the lowering of the pan depends entirely upon the make of carriage used. The one used in my own experiments was a two wheeled hoe sold by D. M. Ferry & Co. under the title "Planet Jr." With this machine the pan was lowered five inches below the axle, which brought it very close to the ground and still kept it level. When placed entirely in front the pan can be raised or lowered considerably to conform to the uneven surfaces on the ground. The notch cut in the bottom is a great aid as it permits the plant to be nearly surrounded before it is disturbed and all insects are caught that jump to the sides as well as back. Another feature that added considerably to the efficiency of the hopperette was a strong twine string stretched across the notch about four inches in from the edge, as at *a*. This not only protects the plants from the sharp edges, but causes the hoppers to leap at the right time. If the holes punched for the string cut it, eyelets may be used or a wire about the same size may be used.

COST OF HOPPERETTE.

The first cost for collecting leaf hoppers in this way is very slight and it takes comparatively little time in collecting, as a man can pass over a considerable area in a day. The pan made of sheet iron cost $1.25. There is no patent on this or the collector spoken of under locusts and they may be made by any tinner. The coal tar used in coating the pan is very cheap. Enough of the tar should be kept in the pan to occasionally run over the bottom and recoat it, and by this means cover over refuse material and insects that have accumulated. Those who may wish to purchase a "Planet Jr." for use in the celery fields and for leaf hoppers too will find it listed in D. M. Ferry & Co's catalogue at $4.00. With an outlay of not over $6.00, and a few hours work, many times that amount will be saved in the celery crop where the little leaf hoppers are at all thick. One may not realize how many there are of them till he stirs the plants and watches the number hop away. In my first trial of the hopperette, the hoppers were not as common as a week or two earlier, but on a row five rods long at least two hundred were caught.

THE TARNISHED PLANT BUG (*Lygus pratensis Linn*).

ORDER HEMIPTERA. FAMILY CAPSIDÆ.

A brown bug that is the cause of the rusty, dead spots and streaks on celery known among growers as one form of "sun scald," but different from the disease known as leaf spot, which will be treated of later.

Although not found in such great numbers as some other pests, the tarnished plant bug is one of the worst with which the celery grower has yet had to contend. It goes directly to the tender stalks of the plant that are blanching and by means of its beak draws the sap from the stem, and

leaves a large brown wilted spot which greatly mars the attractive appearance on the market and lowers the price accordingly. I do not remember of talking with a celery grower this season, who knew the real cause of these brown spots on celery. The most general belief was that it was caused by "sun scald," or perhaps bruised in blanching. This is not at all surprising as the bug is so shy and retiring, when one is near, that it is only by quiet and careful watching that it is seen feeding. Then, too, it

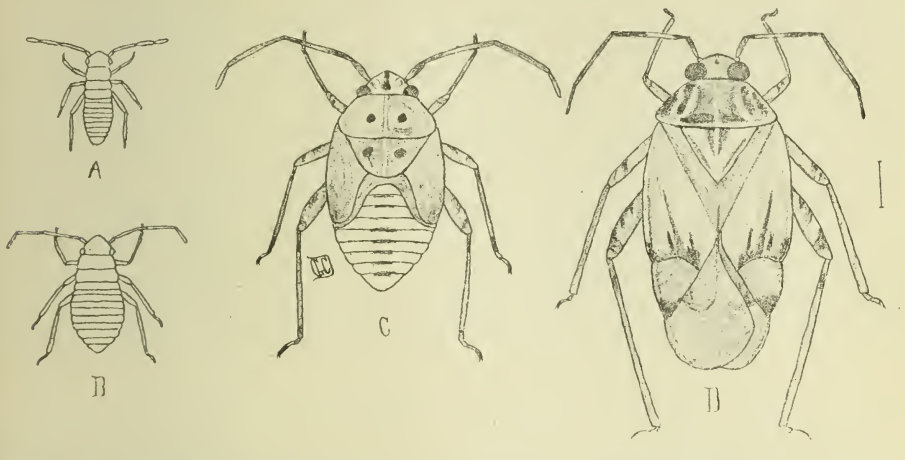


FIG. 6.—The tarnished plant bug, showing the various stages of growth. A, very young bug; B, second stage; C, the fourth stage; D, the matured, winged form. The line at the right shows the natural size —(original).

is almost always well in toward the center of the plant and is protected largely from view. Very often when disturbed, or even on the approach of possible danger, the mature form will take wing and fly away, and the younger ones not having wings will drop to the ground and seek protection there.

LITERATURE.

The tarnished plant bug is a native of nearly all parts of our country. For this reason, coupled with its general destructiveness, it has been made the subject of many articles. Nearly all are brief notices of injury done. The only really extensive or exhaustive article on the species is by Prof. Forbes in the 13th Illinois Entomological Report, 1883, pp. 115-135 (Ill.). All of the more important literature is referred to here. The work treats of the bug as a strawberry insect, causing the berries to shrivel by sucking the juice from them. Pyrethrum is the remedy recommended. In the following year, report 14, pp. 79-80, additions to the previous report are given in which Prof. Forbes describes the egg of the bug and records an experiment with pyrethrum not working as well as expected.

Several other authors have before and since written short accounts of it as a strawberry bug.

The earliest important article was by Dr. Harris in "Insects Injurious to Vegetation," pp. 199-203. Under the name of *Phytocoris lineolaris*, he treats of it as injurious to flowering plants and potato vines, and recommends simple but as inefficient remedies.

THE DIFFERENT STAGES OF GROWTH.

As a usual thing it is only the larger winged form that we notice, the young forms remaining concealed in the denser part of the plant. The common name, tarnished plant bug, is a very appropriate one for the adult as it has a stained or tarnished appearance, though still retaining a polished surface. It is a very variable species in its markings, and has until recently been considered as several distinct species. The females, as in the figure, are quite a light brown with yellowish white markings; the males, a dark reddish brown with scarcely a light marking. Intermediate markings, ranging between the two extremes, may also be found. There are four distinct stages of growth between the egg and the mature form; the first, second and fourth of which are illustrated in the accompanying figure. The small line at the side shows the natural size. The first two stages are entirely wingless, and in color are a light green. They resemble the plant very closely, and this affords them a means of protection which they often make use of by keeping very quiet on the stalk of like color and so are easily overlooked. The next two stages begin to show evidences of the wings, quite small in the first but very distinct in the next. They are still green with a very few dark markings, but the color does not seem to be used much as a protection in these two stages.

THE LIFE HISTORY.

Early in the spring the first insects to make their appearance on early vegetation are the imagos (adults) of the tarnished plant bug. They have lived through the winter in this form, under boards, bunches of dead leaves, grass, rubbish, or anything that they can find which will give them shelter. They are very general feeders as will be readily seen in looking for them on the plants in one's immediate vicinity. They feed on all the common weeds as well as grass, clover, and plants raised for their flowers. The fruit, blossoms and foliage of the pear, apple, quince, strawberry and grape suffer alike from their piercing beaks. Our vegetables suffer in the same way. They not only feed on these plants but breed on them also. Early in the season the eggs, described by Prof. Forbes as minute, white, smooth, slender, oblong ova, are deposited on the plant. From these the young soon hatch. They are at first very slender for their size, but, as they grow older, the imbibing of so much sap tends to expand the body much faster than it lengthens. From the first part of June through the remainder of the season, all stages from the youngest up could be found on the celery though at times certain stages were more common than others. Before the cold autumn weather becomes severe, the adults are again in winter quarters.

BEST MEANS OF FIGHTING THE BUG.

A great many insecticides have been tested only to find them ineffectual and unsatisfactory. Owing to the bug sucking its food from the inside of the plant, no remedies affect it except those that kill by contact. Of these, the kerosene emulsion, so often recommended in our previous bulletins, is probably the best, but as the bugs are so shy and hide, or take flight so readily, a large per cent of them escape even with the most thorough work. It was noticed that in collecting leaf hoppers with the hopperette,

quite a number of tarnished plant bugs were also collected and it seems probable that this is a quicker and cheaper means of fighting them than is any insecticide.

As prevention is better than cure in disease, so it is with this bug, and we must look largely to this means in keeping it in check. The relation between the number of bugs and the manner in which the celery fields and surrounding borders were kept, was very noticeable in every celery field visited this season. If long grass, weeds, loose sods, or boards were left scattered along the border or in the vicinity of the field, the bugs were sure to be there in greater numbers than where everything was kept picked up and cleaned up so that the bugs could find no protecting shelter in which to hibernate. This is the reason certain localities suffered so much more than others. Occasional exceptions in locality were seen, but where such occurred the bugs were scarce in proportion to the care used in keeping rubbish cleared from the fields.

The loss produced by the bug is impossible to estimate as it is not a total loss of celery, but only a decrease in the market price. The loss in this way is a serious one as every celery grower who has a poor article to put on the market well knows; and when it can be avoided, at least the most of it, by a little care and tidiness, it is well that all such precaution be taken.

THE LITTLE NEGRO BUG (*Corimelaena pulicaria*, Germ).

ORDER HEMIPTERA. FAMILY CORIMELAENIDÆ.

The little black bug which appeared so suddenly and in such great numbers on celery this season. It kills the leaves and dwarfs the plant. By the remedies suggested it is thought it can be controlled.

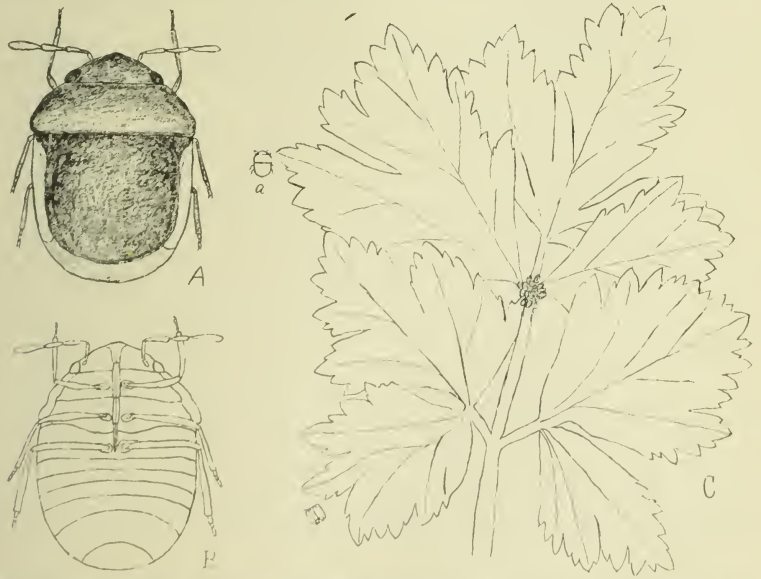


Fig. 7.—The little negro bug. A, upper side much enlarged, *a*, natural size; B, under side of the same showing the beak; C, section of a leaf with bugs at work—(original).

No celery insect up to the present time has caused more alarm over the State than this species did the past season. It came so suddenly and in such great numbers at Tecumseh that for a time it appeared as

though many fields would be cut to the ground in a few days. The attack was quite general all over the celery-growing portions of the State, but not as severe as at Tecumseh and vicinity. The fields at Jackson suffered slightly, and one field at Kalamazoo was quite badly injured. The bugs appeared on the college celery but did no harm.

On the 22d of July letters from Tecumseh and vicinity began coming in, asking for information and help. The following may be taken as a sample of those received.

"DEAR SIR—I mail you a box containing some bugs. Millions on millions have commenced work upon our celery, from twenty-five to fifty collecting about one leaf and in an hour or two it is gone. * * * They are doing great damage and if they last many days, will do many thousand dollars worth of damage. Please state if there is any remedy and how long they will last and what you know about their habits. Please answer at once. Yours truly,

E. L. RUSSELL.

Several similar letters being received the same day made it imperative that something be done, and before Mr. Russell's reply reached him, I was in his field of bugs and celery.

METHOD OF ATTACK.

The attack was very sudden and severe and Mr. Russell's statement was found to be no exaggeration. They had not acquired possession of the entire field, but were extending their domain daily. The first thing that would be noticed in the attack upon a plant was a knot of little black bugs around the node where the three top leaflets met, and here they would suck the sap till the leaflets wilted and drooped, when they would go down to the next joint below and so repeat the operation till the leaf was drained of its sap; then they would pass to another leaf and attack that in the same way. They always went in bunches of usually from fifteen to thirty when feeding. With so many little beaks drawing the sap from the leaves, it is no wonder the destruction was so rapid and alarming.

The attack was almost invariably made on the highest leaves. When one of them was cut down to the denser part of the foliage, the leaf would be left and others reduced to the same level. When they came to the plume (central white leaves), it suffered the same and then the plant was spoiled for market. This habit of taking the highest leaves first is no doubt due to their love for heat and sunlight which they could not have when below the crowded central leaves. In looking over a field after the bugs have worked in it a few days, it has the appearance of having been clipped off about half way down and the dead leaves left just where they had been cut off. The plant would be in a much better condition after recovering from a clipping than from an attack of this kind, as the dead leaves are still attached, which in itself is harmful, and then they so completely cover the living part that it is almost entirely shaded.

In their attack the bugs showed a great preference for the older celery that had commenced to grow stalky and was nearly ready to blanch or was blanching. The younger celery where the leaves were spread out and the center exposed was injured comparatively little. Where the bugs did work on such plants, they were found sometimes on some of the higher leaves as described before and sometimes in little groups around the heart stalks.

THE EFFECT.

As the heart stalks of celery form the edible part of it, the bugs could not have attacked any other part of the plant where as little harm would be done as on the higher and older leaves. Then, too, the severest part of the attack did not last over three weeks. It was the attack of such countless numbers that made their work so severe. Most fields at Tecumseh suffered less than was at first feared, but where the bugs were abundant the loss to celery was considerable. Plants, that had suffered a severe attack, were retarded in their growth from two to three weeks, and when they appeared to have recovered, it was not with the same large perfect stalks, so characteristic of Tecumseh celery, but with a large number of little curling, gnarly stalks that would be of little or no market value. We might as well say that in such cases the crop was an entire loss.

NOT THE CHINCH BUG.

Fig. 8.—Chinch bug (*Blissus leucopterus*).

Owing to the sudden appearance of this little negro bug, a great many in the region thought it surely must be the chinch bug. Some were not convinced till specimens of the chinch bug were sent from Iowa and compared with the negro bug when they at once saw a great structural difference. Both have the odor peculiar to all similar bugs and have a beak for sucking, but are very different in most respects. The form, as will be seen in the two cuts, is entirely different, and the chinch bug is not shining black, but a dull, dusty brown with the terminal half of the wings membranous. There is little danger of a chinch bug invasion as far north in Michigan as the celery fields.

GLEANINGS FROM LITERATURE.

Before we attempt to suggest any remedies let us learn more about the little negro bug's habits, and what others have learned of it.

The earliest account of its destructive habits that was found is an article in the Canadian Farmer for August, 1867, where Rev. C. J. S. Bethune speaks of its attack on strawberry plants in Canada.

In the same year B. D. Walsh, in the Practical Entomologist, Vol. II, p. 119, reports it as swarming on raspberries in Missouri in such numbers as to render the berries worthless both from odor and taste.

Walsh and Riley, in the American Entomologist, report it as puncturing strawberries and causing the blossoms and fruit to wilt; also as attacking the cherry, quince and pear in the same way. The remedy suggested was cresylic soap, which has long since been superseded by better remedies.

Dr. Riley in his second Missouri Report (1870), gives a review of the plants attacked and reports it very common all over the state the year before.

In the Prairie Farmer, August 15, 1868, he reports a new growth of stems and leaves of grape vines injured by it.

In the U. S. Agricultural Report, 1884, p. 390, Mr. Webster reports breeding the bug on wheat.

Prof. Forbes in his Illinois Report for 1890, p. 51, reports it common in

wheat and grass fields along with the chinch bug, and for this reason often considered injurious by farmers, but it seemed to feed only on weeds.

There are a few other minor references, but these give us something of an idea of its habits and the cultivated plants attacked. It always has been known best as a strawberry insect, because the oftenest found injuring that plant. The above references are all largely incidental, but with these and what has been learned of it on the celery this season, we are enabled to more closely determine its

LIFE HISTORY.

We owe thanks to Mr. Webster for assistance by his notes on the early stages of this bug, as it is single brooded and the first brood was mature when found on the celery. His record is: "Adults were observed copulating May 9, and were at once confined on wheat under glass, being fed on ripe strawberries. The females began to oviposit on the 20th, placing their eggs singly on the leaves and sheath of the grain. On the 26th, after depositing a few eggs in the intervening time, they made their escape. The eggs may be described as follows: Length, $\frac{3}{5}$ m. m.; diameter, $\frac{2}{5}$ m. m.; form elongate oval; and when first deposited the color is shining, very light orange, which gradually deepens until just previous to hatching, when it is a livid red. One of these eggs deposited on May 21, hatched June 6, the larva being $\frac{3}{5}$ m. m. in length, brown anteriorly and red barred with brown posteriorly, legs yellow."

Careful search was made for the nymphs through the celery, and only a short distance on one row next to a ditch, were there any found, and then only an occasional one. They were like the mature form except the abdomen was blood red, soft and segmented. These fed in the group along with the adults. After reaching the mature stage they lose their appetite in about three weeks, so that after the 10th of August this year they did the celery no harm and gradually disappeared. Those kept in the breeding jar have not cared to feed, but have have collected in crevices in a semi-torpid state awaiting the coming of winter. They hibernate under boards and rubbish as does the tarnished plant bug.

PREVIOUS APPEARANCE ON CELERY.

With only one exception, no one, when asked regarding the bug, had ever seen it at work on celery before. This one was Mr. Frenthway of Kalamazoo who says he has seen it on his celery for the past seven years; only a few each year, not enough to do any harm. It certainly never has been numerous or others would have noticed its work.

DOES IT BREED ON CELERY?

This is a question which was studied very carefully while in the fields, and while it cannot be said positively that they do not breed on the plant at all, yet it seems very certain that such is the case. In every instance where the bugs were the worst, a rank growth of weeds was found near by. In most instances the weeds had been cut only a few days before the bugs appeared on the celery; but in some cases the weeds, while still standing, were nearly deserted and the celery attacked. The border of the celery field nearest the weeds always showed the first signs of attack,

and was injured the worst for the first few days, after which the bugs would scatter so that no difference could be noticed.

The bugs are not general weed feeders like the tarnished plant bug, but are partial to a select few. They were found feeding on five different species bordering the celery fields, viz: *beggar-ticks, stick-tight or fork weed (*Bidens frondosa*); tick-seed (*Coreopsis trichosperma*); red root (*Amarantus retroflexus*); ground nut (*Apios tuberosa*), and great lobelia (*Lobelia syphilitica*). In addition to these Dr. Riley reports them on rosin weed (*Silphium*) and speed well (*Veronica peregrina*); Webster, on evening primrose (*Œnothera*); Forbes, on plantain (*Plantago lanceolata*), and sometimes on rag weed (*Ambrosia*) and smart weed (*Polygonum persicaria*). When found on these weeds they are always more plentiful than on celery near by; but in some instances where found in large numbers on these weeds a few days previously, the weeds had been deserted and the celery attacked. All seems to point toward their breeding elsewhere than on the celery at present; but even if this is true, should they continue to make celery a food plant, they will undoubtedly make it a breeding plant as well.

INEFFECTUAL REMEDIES.

While celery growers should not be discouraged at the start, for it is probable the bug can be controlled, yet it is quite evident after experimenting with the remedies usually effectual on such insects, that nearly all the remedies belong to this first class—the ineffectual. Our most effectual remedy on the true bugs is kerosene emulsion and this was the first to be tested on these bugs, but they were too well armored for it to penetrate. They were even placed in the dilute emulsion and forced to swim for five or ten minutes, but they soon recovered when taken out and were as lively as before. The full strength emulsion that would kill the tarnished plant bug as soon as dropped into it, would not kill the little negro bug for several minutes. Similar in nature, but even less effectual was "Little's Chemical Fluid," a prepared sheep dip and insecticide.

THE MORE EFFECTUAL REMEDIES.

Finding our most effectual remedies that kill by contact were of no avail, we next turned our attention to repellants and here found a vulnerable point. They were driven and scattered by offensive odors. Crude carbolic acid mixed with water at the rate of a tablespoonful to two gallons and sprinkled over the plants or mixed with air slaked lime or land plaster at the rate of a teacupful to each bushel and dusted over the plants, seemed to serve as a repellant the best of anything tried. The odor from a field sprinkled with carbolic acid water could be detected quite a distance off for at least twenty-four hours after the application was made. The odor from carbolized lime is not nearly as strong but seems to be more permanent. Lime alone was of little effect. It was intended to procure some gas lime (a refuse product in the manufacture of gas), but none could be obtained, and ammonia water with a strong sulphur and coal tar odor was taken instead. For the plants it had to be reduced at least seven-eighths, but the bugs could swim in it full strength without appar-

* The plants were determined for me by our station botanist, Mr. C. F. Wheeler.

ent injury. As a repellant it did some good, though not equal to carbolic acid. Other repellants, such as coal-tar water, salt, sulphur, etc., were tried but were of no evident effect.

The only remedy found which would *kill* the bugs was hot water. Celery will endure a stream of water heated to 175° Fahrenheit, and the bugs succomb at 155°.

MEANS OF CONTROL.

We now come to the most important part, viz.: how to protect from future attacks. With the present knowledge that we have, probably the best method will be a combination of the carbolic acid and hot water. It is probable that the bugs will appear about the same time again next season, and careful watch should be kept from the 10th of July on. When they appear it will be in large numbers in some spot along the margin, and this is the time to treat them before they spread over the field. Carbolic acid can then be used on the plants surrounding the bug-infested patch for some distance back, or to make it more certain, on the remainder of the field; then, while the bugs are held in this little patch, dose them with hot water. It should be between 155 and 175 degrees Fah. when it strikes the bugs. The use of hot water is impracticable in a large field, but if used only on a little patch, is not so difficult. It may be applied with a cup from a pail or with a spray pump without the spraying nozzle. The water must be thrown in a stream, as it will cool too rapidly when thrown in a spray. The application of hot water will necessitate the use of a thermometer that the temperature may be accurately known.

A good precaution against attack would be to keep all weeds in the vicinity of the celery fields and along ditches cut down close through June and July so as to prevent the bugs from breeding on them. Unlike the tarnished plant bug, the amount of rubbish under which the negro bug can hibernate does not seem to affect its numbers in the least.

THE 13-SPOTTED LADY BIRD BEETLE (*Hippodamia 13-punctata*, Linn.).

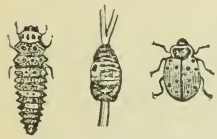


FIG. 9.—The three stages of the 13-spotted lady bird beetle, nat. size.

Many suspected this spotted beetle, which was so often present with the little negro bugs or found at the node after it was left by the bugs, of helping harm the celery; but the beetle was there only for the sap that issued from the wounds made by the bug. The beetle is one of our little friends as it feeds on plant lice and seldom, if at all, on the plants themselves.

THE THREE-LINED THRIP (*Coleothrips trifasciata*, Fitch).

ORDER HEMIPTERA. FAMILY THRIPIDÆ.

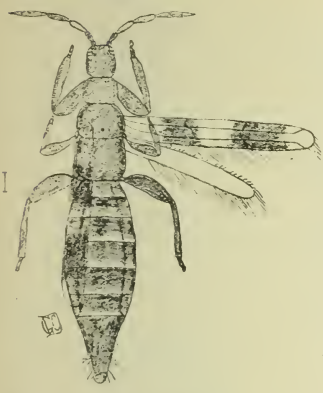


FIG. 10.—The three-lined thrip; wings in natural position on one side and spread on the other. The line at the side shows the nat. size —(original).

In June and July these very minute sap sucking insects were common on the celery at the college. The species is our most common one in the heads of clover and is found on onions and various weeds. The individual specimens are only about one-eighth of an inch long, slender, and prettily marked with three white cross bands along the wings. They were found mostly on the tender central portion of the plants, often hid in considerable numbers between leaves, but as often scattered singly all over the plants. They no doubt assisted the leaf hoppers in making the celery look sickly, but they are so minute that they are not likely to do special harm unless very numerous. Should this occur, a spray of kerosene emulsion will diminish their numbers.

The method of preparing the kerosene emulsion may not be well known to all celery growers, and so it will be given: To two quarts of water add one quart of soft soap or one-fourth pound of hard soap, and heat the whole to boiling. When the soap is dissolved, take from the fire, add a pint of kerosene and agitate so thoroughly and rapidly with a force pump without the nozzle that the mixture will foam like milk when filling the dairyman's pail on a summer's evening. It should be churned in this way until the soap and oil become permanently mixed; that is, until the oil will not rise or appear on standing or when diluted. This will take at least three minutes rapid work. Stirring with a stick or spoon or slow pumping will not emulsify the soap and oil, though an egg beater may be used for a very small quantity. The emulsion as first made is too strong and will injure the plants unless diluted before applying. The soft soap emulsion should have as much water added as there is emulsion, and the hard soap emulsion, twice its bulk of water added and well stirred. They are now ready to be applied with a spray pump. The dilute emulsion should be stirred frequently in applying.

The above is the regular formula. The emulsion can be made in larger quantities in the same proportion, but if made in quantities larger than six or eight times the regular formula, it will be difficult to make a stable emulsion with a small hand force pump. This has been one of the discouraging features in the use of kerosene emulsion. It now seems evident that we can overcome that difficulty in a large measure. The method is to use the soft soap formula, as given above, without the water. The soft soap is heated until it becomes liquid and then, without water, add half as much oil as there has been soap used, emulsifying according to the directions given as above. The emulsion made in this way is as perfect as when used with water and it is so concentrated that it is one-third oil, or in other words, the same emulsion in this way occupies less than one-half the space that it would when made by the first formula given. An emulsion made in this way, without water, will need to be diluted with four times its own bulk of water before using.

THE CELERY APHIS (*Rhopalosipum dianthi;* Schr).

ORDER HEMIPTERA. FAMILY APHIDÆ.

Nearly all plants are troubled with plant lice, or "green fly." On celery the above named species has been very common except from the latter part of July till the September rains came. Prof. T. A. Williams of the South Dakota station and Mr. F. A. Sirrene of the Iowa station pronounce it a very common species feeding on many plants. The dark, winged form has been the most conspicuous and so common at times that a dozen or more could be counted on single plants. The very young wingless ones were found early in the season and very late, but through the rest of the season neither young nor old were found. They probably breed on some other plant. Had they continued to breed in the field throughout the season as rapidly as they did in the breeding jar where confined, the plants would have suffered severely. As it is, they did little harm the present season. It would not be surprising if they should acquire a better liking for celery and in a few years should breed on it. As with the Thrip, kerosene emulsion becomes our "helper in the time of need."

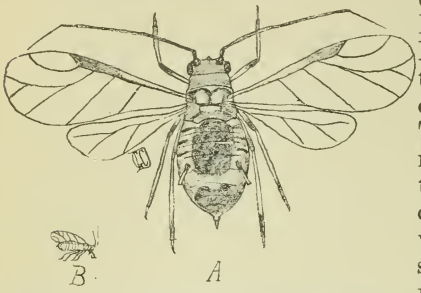


FIG. 11.—The celery aphis; enlarged and wings spread at A, side view and natural size at B —(original).

THE CELERY APHALARIA (*Aphalaria calthea*, Linn).

ORDER HEMIPTERA. FAMILY PSYLLIDÆ.

This is another insect very closely related to the celery Thrip and Aphis, that was on the plants in the spring along with these two species and about as common. Later in the season it was not found. It is about the size of the celery aphis and is of a yellowish brown color with a reddish tinge. The family to which it belongs is known as "jumping plant lice," because many of the species jump rather than fly. There are but few of the species known to be injurious, and it is not at all probable that this species will be a serious celery pest. If at any time it becomes so, the best remedy that can be suggested is the kerosene emulsion.

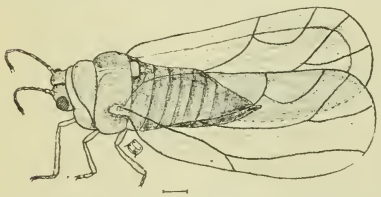


FIG. 12.—The Celery Aphalaria, enlarged as shown by the line beneath—(original).

OTHER LESS COMMON BUGS.

Besides the species of true bugs already considered, there were several others found less common on celery which were either seen sucking the sap or else known as plant feeders. The most conspicuous one of these is a common stink bug, *Euchistus tristigmus*. It is a broad flat bug that seems to prefer a mixed diet, as it was not only found with its beak thrust

into the celery stalks but into some unfortunate larva that came in its way. The species is not common enough to do any great injury, but another darker and somewhat more slender species, closely related to the tarnished plant bug, may prove harmful. This species is known as the dusky plant bug, or *Deræocoris* (*Calocoris*) *rapidus* Say. It was only occasionally found on celery this season. Two other species, *Agalliastes associatus* Uhl. and *Poeciloscytus basalis* (?) Reut. were also occasionally found. Remedies suggested for the tarnished plant bug will apply also to these species.

CELERY BEETLES.

In this order of insects, the beetles, with their hard shelled wing covers, the injurious species are very few. What there are belong to one tribe —the flea beetles. They are given this name because when disturbed they will leap and jump like fleas, instead of flying. The largest of these little beetles is not over a twelfth of an inch long. In feeding they are not like the bugs just treated of, but have biting mouth parts with jaws that chew the leaves. The work of the flea beetles is easily recognized by the numerous little round holes that will be found eaten in the plant on which they feed. We always find them the worst in the early part of the season when the plants are young and tender. On the celery there were three species, *Longitarsus melanurus* (Fig. 13), *Crepidodera cucumeris*, and *Chætocnema parcipunctata* that were common in the order named. The second species named, along with the turnip flea beetle, *Phyllotreta vittata*, has often done much harm on our grounds to turnips, radishes, tomatoes and cabbages, and no doubt their work is familiar to all. They have often skeletonized the leaves so that little but veins would be left, or with the plants recently transplanted, have eaten them so that they have wilted and died. The work of the flea beetles on celery is the same as on other plants, and their work in spots last spring was considerable. If the beetles are at all numerous at transplanting or soon after, they will soon do the plants harm and the plants should be freed of them. To do this a very safe and sure means would be to use the hopperette spoken of under leaf hoppers on page 29. The beetles are very easily disturbed and leap so readily when it is warm that they are almost sure to be caught. Prof. Cook found a few years ago that a strong tobacco decoction worked admirably in keeping the little flea beetles off the plants. He used a double handful of tobacco dust to each gallon of boiling water.

FIG. 13.—*Longitarsus melanurus*, one of the celery flea-beetles—(original).

THE CELERY CATERPILLAR (*Papilio asterias*, Fabr).

ORDER LEPIDOPTERA. FAMILY PAPILIONIDÆ.

We now come to the caterpillars that in the mature form become butterflies and moths. The first caterpillar of which we treat is one of the most conspicuous of all the celery insects. Its large size when nearly grown, and the striking color of yellow with black transverse bands, makes it on

the dark green background of the celery leaf an object that is readily seen. It has been known as a celery caterpillar for some time. Every year we receive specimens of the caterpillar with a great many queries regarding it; not particularly because it is so plentiful, but because it so quickly catches the attention and arouses the curiosity. The Y-shaped yellow horns, that it throws out when annoyed, have no sting and are harmless. They are scent organs that emit a very disagreeable odor as a protection against its enemies.

FROM CATERPILLAR TO BUTTERFLY.

Of course, this caterpillar first hatched from an egg that was laid on the celery plant. At first the caterpillar is small, but in only a few weeks it has grown to its full size. Then it attaches itself to the stem and in a few hours time the caterpillar will have become a chrysalis as seen at *d*, Plate II. This is the resting period, as it has little power to move and eats nothing; but on some bright sunny morning a fresh, new, black and yellow butterfly comes from this pupa case and spreads her gauzy wings ready for flight. The butterfly feeds only on the sweets from flowers and does the celery no harm, except that, after a few days of her career, she haunts the celery field and deposits her eggs there for another brood. The caterpillars are the most common through September, but are occasionally seen in July and August. They live through the winter in the chrysalis stage.

OTHER FOOD PLANTS

Parsnip, carrot and wild parsnip are fed upon by this caterpillar as readily as celery. Many other plants as caraway, parsley, sweet fennel, etc., belonging to the same family, also furnish it food.

NUMBERS REDUCED BY A PARASITE.

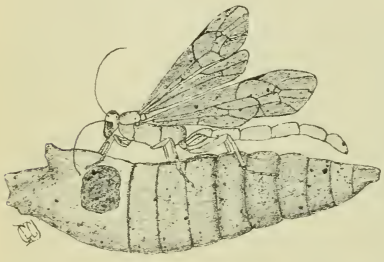


FIG. 14.—*Trogus exessorius* on the pupa case from which it has issued at the side. Twice natural size (orignal).

Whenever these caterpillars are present, wasp-like parasites with yellowish red bodies and black wings, may be seen darting through and around the plants in search of their host. The young of these parasites feed inside the caterpillars, and after the caterpillar has changed to a chrysalis, the parasite gnaws a hole in the case and comes forth instead of a butterfly. The parasite (*Trogus exessorius*) helps greatly to keep the number of caterpillars lessened.

REMEDIES.

As a usual thing the caterpillars will not be plentiful enough to need special attention. When so large and conspicuous, hand picking would be a ready remedy.

PARIS GREEN AS A REMEDY.

Our usual remedy for all caterpillars is Paris green or some of the arsenites, when they can be used without endangering the plant for food. Celery is a plant that will permit the poison to settle around the edible

PLATE II.—Transformations of the celery caterpillar. *a*, egg; *b*, full grown caterpillar, *c*, front view of the head, showing the scent organs; *d*, chrysalis attached to a stem; *e*, butterfly at rest; *f*, butterfly with wings spread—(after Weed).

portion at the base and caution has been used in recommending the arsenites. To test the possibility of poison being concealed between the stems, a row of plants was sprayed with Paris green at the rate of one pound to 175 gallons of water. Two weeks later a part of the same row was again sprayed with the same. The plants then stood another week when both lots were taken up, the roots, leaves and green stems taken off, and the remainder washed under the hydrant without separating the stalks. The bunches were in this way prepared as they are for market. They were then sent to our chemist for analysis.

His report is as follows:

Agricultural College, Mich., Oct. 12, 1893.

DEAR SIR—The specimens of celery sprayed with Paris green have been analyzed by Mr. Harrison, and the quantity of arsenic ($As_2 O_3$) determined in a pound of celery.

He finds the following quantities of arsenic in grains in one pound:

No. 1, sprayed once ..... .0244 grains
No. 2, sprayed twice ..... .0368 "

Yours truly,
R. C. KEDZIE.

This amount, Dr. Kedzie tells me personally, would not poison anyone at once but the effect would be evident with frequent use. The poison was freely applied, much more thoroughly than it generally would be, that our information might be certain whether or no it might be recommended. From the above analysis we can hardly recommend the use of any of the arsenites to protect celery against insects and must resort to anti-poisonous remedies.

THE ZEBRA CATERPILLAR (*Mamestra picta*, Harris).

ORDER LEPIDOPTERA. FAMILY NOCTUIDÆ.

A common zebra-like caterpillar that feeds on the leaves of celery. It is found occasionally early in the season but becomes more plentiful and often harmful later.

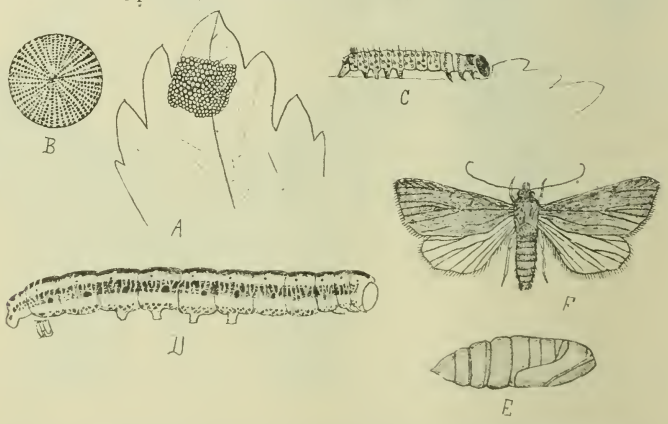


FIG. 15—*Mamestra picta* in its various stages. A, cluster of eggs as seen on a leaf; B, one of the eggs magnified; C, the young caterpillar; D, the mature caterpillar; E, the pupa; F, moth. All natural size except the single egg—(original).

Though not as large, this caterpillar is even prettier and more striking than the preceding species. For the seasons of 1891 and 1892, this was the most common celery pest reported to us. Last year it was very com-

mon on our own celery, but it was the late brood, and although it nearly stripped the leaves in some places, the work came so late that the celery was nearly ready for market and had completed its growth. Parasites so thinned the numbers of the caterpiller last fall and early this summer that this season only a few appeared. The caterpillars feed only on the leaves, remaining in a group while young, but soon separate and feed by themselves.

LIFE HISTORY.

The eggs (see A, Fig. 15) are placed by the moth in a little group on the under side of the outer leaves, often near one edge. She is very prolific, laying in a compact bunch usually from 125 to 150 eggs, but in one instance this season a cluster of 452 eggs was counted. In from two to three weeks the eggs hatch into little hairy, speckled, white caterpillars with a black head and black crescent on the thorax. While in this condition they feed in a group and will suspend themselves by a web when disturbed. Their life in this attire lasts only two or three days when they don a bright new coat entirely different from the former one. The covering now is of much the same color that it is in the mature form. The head and legs are a reddish yellow and the rest of the body black except the two stripes, one bluish white and the other light yellow, connected by irregular cross lines. The caterpillars pass through several more moults as they grow. At maturity they measure nearly two inches in length. They then go into the ground where they pupate and after they remain in this resting stage for a short time, appear as a moth.

There are two broods each year, the first one coming in June and July and the second appearing in September. This last brood is hardly half grown when it leaves the celery for winter quarters in some protected place and comes forth early in the spring to complete its growth.

PARASITES.

The second brood last fall were largely parasitized by a small four-winged fly (*Microplitis mamestræ* Weed), bred from the zebra caterpillar and described several years ago by Dr. Weed. We have no access to his papers on this parasite, but perhaps a few notes from what was observed by myself will show the method of its work to those not familiar with the ways of parasites. By the time the caterpillar is nearly half grown the parasite inside the caterpillar is full grown. It then issues from the side of the caterpillar only a short distance in front of the last pair of legs. When only part way out it begins spinning its silky threads and attaching them firmly to the caterpillar around it. From this foundation it weaves out by looping the web outward nearly an eighth of an inch and fastening each time as it is brought back. After a little basket is formed in this way on one side, the parasite issues entirely and enters the web sack it has made. The next thing is to stretch and shape the sack, strengthening it all the while in the weak places. Then begins the gradual closing of the embryo cocoon around the parasite, finishing last on one side next the caterpillar, but before entirely enclosed it fastens webs that draw it tight to the side or else under the caterpillar. The work so far has taken the caterpillar about three quarters of an hour. The rest of the work is a series of weaving, turning, pushing and shaping till it has made the web so thick in two or three hours that it can no longer be seen. The cocoon is about one-

fourth of an inch long. The caterpillar remains inactive after the parasite escapes and in a few days dies because of the internal injury done by the parasite. Safe in its tightly woven cocoon the parasite remains till the following spring when it comes forth as a winged fly to attack other caterpillars.

This season none of the Microplitis have been seen, but another parasite has been even more destructive to the Mamestra. These parasites are so minute they can hardly be seen with the naked eye, being three-fourths of a millimeter, or one thirty-fifth of an inch long. They do not attack the caterpillar but mature inside the eggs of the Mamestra and destroy them before they hatch. From two-thirds to three-fourths of most of the bunches were destroyed in this way. The parasitized eggs change to a dull lead color in a few days. Mr. Ashmead writes me that he has bred the same species from the cotton boll worm (*Heliothus armigera*) of the south and has given them the name *Telenomus heliothidis*.

In addition to these two parasites on *Mamestra picta*, two predaceous species were seen doing their share in destroying the eggs. One of these is a lady bird beetle (*Megilla maculata*), and the other is the tarnished plant bug (*Lygus tercicus*) previously treated of as a celery pest. Our celery pest in this case becomes a destroyer of another pest by inserting the lance of its beak into the eggs and sucking the contents. The lady bird beetle eats shell and all, but the bug leaves the shell entire though usually it is split where the lance enters. Seeing every once in a while quite a number of the egg cases empty and split open in this peculiar manner, I was led to watch for the cause of it. I soon found a tarnished plant bug at work on a cluster of eggs and watched it for some time. The eggs seemed to be greatly relished by the bug as it would repeatedly return when driven away and begin feeding at once. With so many vigilant foes to overcome, the zebra caterpillar will have difficulty in reaching maturity.

FOOD PLANTS.

The caterpillars of this species are very general feeders and are especially fond of most garden crops. They sometimes become plentiful enough to be injurious. Dr. Harris, in his "Insects Injurious to Vegetation," p. 451–2, gives us one of the earliest accounts of its destructive work. He mentions it as injurious to cabbages, cauliflowers, spinach and beets.

Dr. Riley in his 2d Mo. Report, p. 112 (Ill.), after giving habits and history, mentions, besides many weeds and flowers, asparagus in addition to those given by Harris.

In the 6th Ill. Report, p. 60, Thomas reports it being very partial to the leaves of the pea.

In the 5th Ent. Report of N. Y., p. 206–10 (Ill.), Dr. Lintner gives a very complete article on the species and adds currants and buckwheat to the list of food plants.

Here at our college we found them common on two species of clover, alsike and alfalfa.

REMEDIES.

When a cluster of eggs is found on a celery leaf or the very young larvæ are seen, they can be very easily crushed. With the older ones Dr. Lintner has found that pyrethrum powder mixed with five parts of flour and dusted

over the caterpillars was a very satisfactory and speedy remedy. The powder can be bought already prepared at the stores. Care should be used, though, to see that the dealer obtains it fresh from the factory, as the powder loses its strength upon standing any great length of time. The powder is made from the blossoms of a plant similar to the chrysanthemum and is perfectly harmless to man and all animals breathing with lungs.

THE SPOTTED CUT-WORM (*Agrotis C-nigrum*, Linn.).

ORDER LEPIDOPTERA. FAMILY NOCTUIDÆ.

A fat, light colored caterpillar with dusky spots taken on the stalks of blanching celery. It is usually known as the corn cut-worm, because so often found injuring corn in hills.

A single specimen of this cut-worm was taken July 28, feeding on the stalks of a celery plant after it was boarded for blanching. The cut-worm pupated August 9, about half an inch below the surface of the ground and appeared as a moth September 5. This was the only cut-worm found, although quite a number of the moths were seen early in September, and also moths of *Hadena sputatrix* were quite plentiful in the various fields and probably this species feeds on celery also.

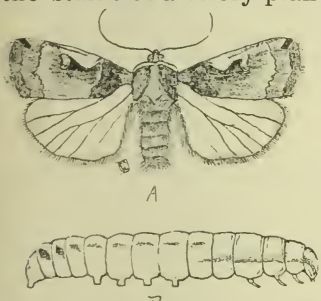


Fig. 16—The spotted cut-worm B, and moth A; both natural size—(original).

The c-nigrum is usually known best as a corn cut-worm. It is also known to destroy cabbages and other garden plants. In 1890 it was reared here on the currant by Prof. Cook from eggs found June 26. There are two broods each year, the last one remaining over winter in the grub state. There need be little fear of either of these cut worms becoming plentiful enough to injure the crop seriously as long as the soil is kept constantly stirred, as it is, from early spring to late fall. Should they become numerous, their work on the stalks may prove quite serious and in such a case bait traps of little bundles of clover poisoned with Paris green and distributed through the field, will be found helpful.

THE CELERY PLUSIA (*Plusia simplex*, Guen.).

ORDER LEPIDOPTERA. FAMILY NOCTUIDÆ.

Feeding on celery, lettuce and a few other plants; a naked, green, span worm, whose body is marked with eight white lines, and is provided with only twelve legs.—*Coquillett.*

A single specimen was taken in the pupa stage, wrapped in a white silken cocoon, and this rolled up in what was left of a leaf it had nearly eaten. The moth appeared on the 14th of July.

In the 11th Ill. Ent. Report (1882) p. 38, Mr. Coquillett reports this Plusia as destructive to celery in many gardens in the locality of Germantown, Ill. It is very closely related to the cabbage Plusia that becomes destructive at times and then apparently disappears for years before again attacking the cabbages in numbers. The habits of the celery Plusia are probably much the same. In the absence of a drawing, a few words from Mr. Coquillett's description may enable growers to identify the caterpillar. The body is very robust posteriorly, from whence it tapers to the head. It is a pale green, with a dark line on the back, and on each side three white lines, the middle one longest. Below and above the white stigmal line the body is dark green. The white spiracles are ringed with

black. The head is green with black eyelets. Length one and one-fourth inches when full grown. The moth is slightly smaller than that of the spotted cut worm (Fig. 16) and is marked with light gray and dark brown with a silvered hook extending into the center of the front wings. Three broods each season are reported in Illinois by Mr. Coquillett.

REMEDIES.

The only remedy suggested is cold water. In his rearing experiments with the larvæ, Mr. Coquillet found the leaves when wet produced a disease of violent scouring that soon killed the caterpillars. The specimen reared by myself seems to be an exception to the rule as the weather was exceptionally wet up to nearly the time of the appearance of the moth. Perhaps it was owing to confinement that the water produced such an effect. Should this not prove sufficient, the pyrethrum powder spoken of under the zebra caterpillar no doubt will be effectual.

THE CELERY BORER (*Phlyctænia ferrugalis*, Hbn.).

ORDER LEPIDOPTERA. FAMILY PYRAUSTIDÆ.

Greenish translucent caterpillars, about one inch long, that were taken both boring in the stems and feeding on the leaves.

The habits of this species seem quite variable. It both bores in the stems and feeds on the leaves. While at Kalamazoo the 26th of August one of these caterpillars was found burrowing on the inside of the celery stalks close to the base. The crown had been eaten out and the plant nearly eaten up. The outer leaf stalks were channeled at the base and nothing left except the shell on the outer side. An immense amount of frass was left for so small a feeder. No other plants near this one seemed to have been molested. On the same day in other fields larvæ that appeared to be the same were taken quite plentifully either rolled up or sewed in between celery leaves. These caterpillars fed on the leaves around them and did not molest the stems. Both lots were placed in separate breeding jars, but from this on, all acted and fed alike. On the 28th the most of them webbed up between the leaves, or cut chunks of leaves out and pasted them to the jars. Others webbed up a day or two later. The first moths appeared the 14th of September. The borer appeared the next day and proved to be the same species as the others.

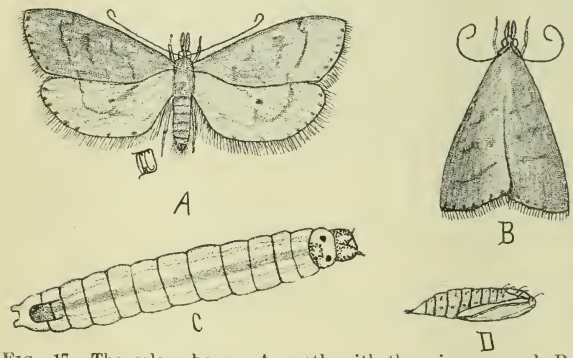


FIG. 17.—The celery borer. A, moth with the wings spread; B, same with the wings folded and at rest; C, top view of the full grown caterpillar; D, the pupa. Twice natural size—(original).

REFERENCES.

For the identification of this and the following species of small moths and references to them, I am indebted to Prof. C. H. Fernald, our well known authority on the Micro-lepidoptera. He writes me that to his knowledge the species has never been bred in this country before. In an

English periodical (Entomologist's Monthly Magazine, Vol. XIV, pp. 200–204) we find all the early stages fully described. This species was bred on the leaves of boneset (*Eupatorium*), and was also taken on hedge nettle (*Stachys*) and strawberry leaves. It is thought to be two or more brooded.

DESCRIPTION.

The full grown larva is nearly an inch in length. Head and thoracic shield drab, with black markings as shown in the drawing. Along the body is a dark green dorsal line on each side of which is a very faint almost obscure opaque white line merging off to a translucent greenish and bordered by another opaque white line. On the sides is a very obscure yellowish green line. There is a distinct caudal shield of white and dark green. The caterpillar is sparsely covered with hairs.

The moth is reddish brown on the front wings and a grayish brown on the hind wings. Both have the faint black markings shown in the drawing.

REMEDY.

It is probable that the usual habit of this caterpillar is to draw the leaves together and feed on the leaves rather than bore in the stem. When feeding on the leaves alone it does much less harm. At present the species is not plentiful enough to cause any immediate alarm. Were the life history of the species better known, it is probable that some good means of control could be found.

THE SULPHUR COLORED TORTRIX (*Dichelia sulfureana*, Clem).

ORDER, LEPIDOPTERA. FAMILY, TORTRICIDÆ.

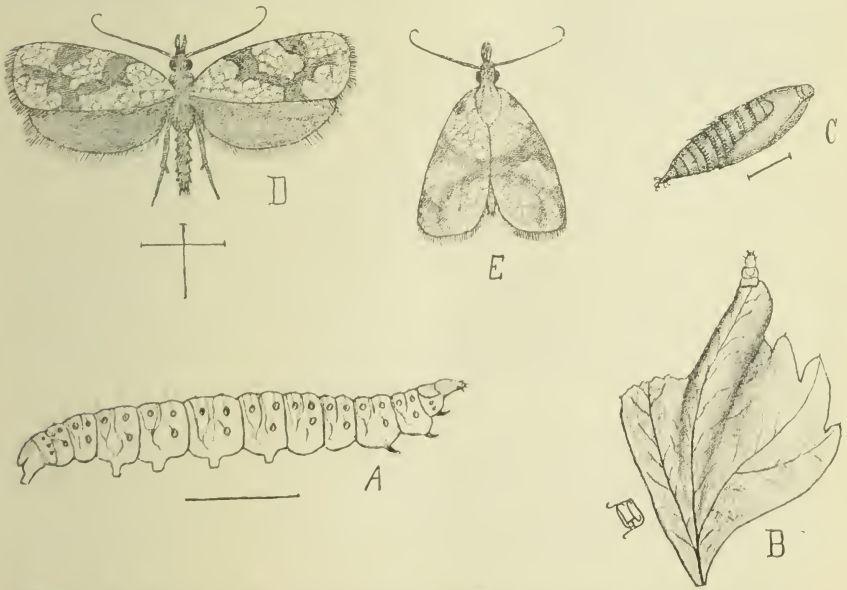


FIG. 18.—The sulphur colored tortrix. A, full grown caterpillar; B, the same as seen rolled in a leaf; C, the pupa; D, the moth with wings spread; E, same with wings closed and showing variation in color markings. The hair lines show natural size—(original).

This was the most common celery leaf roller found this season. It was found more or less common in every locality visited. There are at least two broods and probably three. Of the first brood noticed the larvæ became full grown about the first of August and pupated early in the month, remaining from five to nine days in this state before issuing as moths. The next brood reached maturity the latter part of September and probably remain over winter as pupæ. Previous to this the species has been bred on clover and common buttercup (*Ranunculus acris*).

The larvæ are light green all except the tips of the mandibles (jaws), labrum (upper lip), and front feet which are black, and the head and thorax which are lighter—almost a flesh color. They live in leaves drawn together around them by a web which they spin, and feed on the adjoining leaves. They pupate in the same leaves in which they live. The little moths are a bright sulphur yellow with a network of small red lines and larger reddish brown bands on the primary wings. The hind wings are dusky. The band on the front wings varies considerably, the two extremes of the specimens reared being shown in the figure.

Should the species become still more common, and perceptibly reduce the foliage of the celery, it is probable that a great deal can be done to prevent the attack by cleaning up all leaves and refuse material left in the field in the fall and burning it. From our present knowledge, it would seem that this would destroy many winter pupæ.

THE CELERY TORTRIX (*Sericoris bipartitana*, Clem).

Only occasional specimens of this species were found. The larvæ feed on the leaves and live in a gallery made by drawing several leaves together. They are half a inch long, or a little more, quite slender and very active, throwing themselves with great violence when taken from the case. They are a dark greasy brown (almost black) with black shield on thorax, legs and plate on terminal segment black, prolegs and under side lighter. There are four shining dots above on each segment forming a square. On the sides are pits, one to each segment, and a dot above and below. The body is sparsely covered with hairs. They pupated early in August and appeared as a moth two weeks later. The moth is black and white with dark posterior wings and light abdomen. Prof. Fernald says the species has never been bred before to his knowledge.

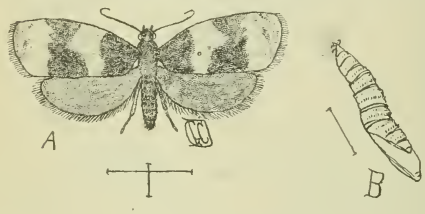


Fig. 19—The celery tortrix three times the natural size. A, moth; B, pupa—(original).

OTHER CATERPILLARS ON CELERY.

One of our common leaf rollers and one that we might expect to find on celery, as it is such a general feeder, is the oblique banded leaf roller (*Cacœcia rosaceana* Harr.). The pale green caterpillar is one of our largest, plumpest leaf rollers.

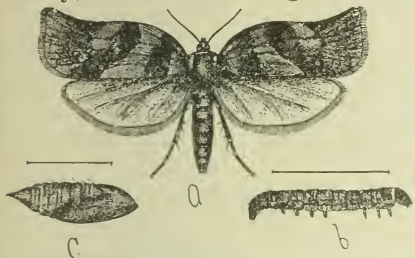


Fig. 20—The oblique banded leaf roller, *Cacœcia rosaceana*, *a*, moth; *b*, caterpillar; *c*, pupa —(after C. F. Baker).

Very similar in shape but of a uniform buff color is another moth (*Tortrix pallorana* Rob.) that was bred on the leaves of celery, August 17. It is a leaf roller with habits similar to the others, and is also quite a general feeder. Only one specimen of each of the above species was reared. Another caterpillar that destroyed at least two rather small plants by eating stems and leaves was the large hairy red and black one (*Pyrrharctia isabella* S. & A.) that is so common everywhere in the autumn. It is probable that this one specimen was rather partial to celery as others of the same species were found around celery that did not seem to feed on it at all. In confinement they eat it readily.

There were several other caterpillars (at least four species) that were taken feeding on celery but they did not reach maturity. One of these was a dark, dingy specimen, about half an inch long, that bored in the hearts of very young plants. It possibly was a cut-worm but looked more like the larva of a butterfly. Only the one was found and by an accident it escaped from confinement before reaching maturity. Another partly grown specimen was determined at Washington, D. C., as probably *Leucarctia acrea*.

"RED SPIDER" (*Tetranychus telarius*, Linn).

ORDER ACARINA. FAMILY TROMBIDIDÆ.

Our common little greenhouse mite, commonly known as "red spider," has taken a liking to celery this season and enrolls itself along with the celery insects. The latter part of the season was extremely dry, and favorable for its increase and, before the drought was broken, little blotches made by the mite began to appear in places quite thickly over the under side of the leaves. By raising the leaf the yellowish mites about the size of a pin head, will be seen through a slight web in which they live. They thrive only in a dry, hot atmosphere, and plenty of water is equivalent to poison for them.

Quite a number of other insects of various orders were collected on celery and although suspicion brands many of them as celery insects, they are not mentioned, as they were seen neither feeding nor breeding on the plant. Being in the fields only at intervals has interfered somewhat with extended observations that are so essential to the best work. Enough has probably been given to show the number of insects the celery grower must compete with in raising his crop.

CELERY LEAF BLIGHT.

As the leaf blight is dwarfing and injuring celery so much in many localities and spreading to others, it was thought best to investigate this disease and give it a portion of our consideration along with the celery insects. In many places over the state the leaf blight is not known. In fields where celery has been grown on the same ground for a series of years, the blight through the hottest part of the season is severe. It is very generally known among celery growers in these places as "sun blight" and is supposed to be produced by the hot sun. One season, several years ago, it took nearly the whole celery crop at Kalamazoo. The blight has troubled the fields in the northern peninsula for the past three years, as Mr. Wheeler, our station botanist, learns through correspondence. The same letter says, "White Plume' and 'Golden Self-Bleaching' suffered more than other varieties. "Henderson's New Rose" has been entirely free from blight."

The blight is caused by a fungous disease working inside the celery leaves. No experimental work has been done on it here. Dr. B. T. Galloway has experimented on the blight in eastern fields and he kindly sends his unpublished notes for our use. The following are his notes in full:

CELERY LEAF BLIGHT, AS AFFECTED BY WATER SUPPLY TO THE PLANT.

Celery leaf blight, caused by *Cercospora apii*, is an exceedingly destructive disease, especially in the eastern part of the United States. For several years we have been making experiments in the hope that some means of cheaply preventing the trouble might be discovered. In 1890, 1891 and 1892 a number of trials made were with various fungicides, including both liquids and powders, but none of these gave very satisfactory results. In every case where the celery was planted on upland soil it blighted badly, despite the fact that the leaves were kept nearly covered with such well-known fungicides as Bordeaux mixture, ammoniacal solution of copper carbonate, etc. Where these preparations were used, however, the celery was not so badly attacked by leaf blight as the plants receiving no treatment at all.

Noticing that celery on low, moist ground was seldom severely injured by blight, an experiment was made in 1892 on upland soil to test the effect on the disease of water applied to the roots. The plants selected for the experiment were fully exposed to the sun and were set in such a way that they could be flooded sufficiently often to keep the ground always soaked. Without any further treatment these plants made a vigorous growth and were almost wholly free from blight. The average height of the plants when bleached was thirty-two inches. Plants in the same bed which received only water falling naturally, as rain, blighted very badly, in consequence of which there was not enough leaves to bleach when the time came for this operation. In height these plants averaged a little over eight inches, or about one-fourth that of the watered celery. The experiment shows the importance of an abundant water supply for this crop and explains in a measure why in certain localities celery is seldom affected with the disease. Of course it may not be practicable for all upland celery growers to water as extensively as seems necessary to keep the crop growing and free from disease, still there are no doubt many places where irrigation could be practiced at comparatively little expense, making the crop, even in regions where the soil and climate is naturally unfavorable, a certain and profitable one.

G. C. DAVIS.

MICHIGAN

STATE AGRICULTURAL COLLEGE

EXPERIMENT STATION.

HORTICULTURAL DEPARTMENT.

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1894.

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BULLETIN 103.

PEACH AND PLUM CULTURE IN MICHIGAN.

BY L. R. TAFT.

INTRODUCTION.

The importance of peach and plum growing as productive industries is but slightly appreciated, except by those persons who have visited the large commercial orchards in the fruit-growing sections, during the shipping season. During the past two or three years the crops have been so remunerative that the acreage has largely increased, and many persons have engaged in growing these fruits who have had little or no experience. In order to handle their orchards successfully they have endeavored to inform themselves as to the best methods to pursue and, as one source of information, this station has received numerous letters asking about the best locations and exposures for peach growing, the methods and time for pruning, the best soil and fertilizers, the varieties to plant, and the methods of combatting the various insects and diseases.

Appreciating the importance of these crops, and the necessity for accurate information as to the proper way to handle them, the following bulletin has been prepared. In the few pages that we shall devote to the subject, it is our aim to take up such topics relating to the cultivation of these fruits as seem of most importance, and regarding which the most inquiries have been received.

As is well known, it will be difficult to find two fruit growers who can agree upon all matters of planting, pruning, cultivation, etc., and it cannot be expected that every one will coincide with the methods of procedure here recommended. It must be understood that the character of the soil, of the season, the variety, or the surroundings, will exert such an influence that what may be a proper method of handling an orchard at one time or place, may be unwise at another. On the other hand, while, under average favorable conditions, some particular distance of planting, height of head and method and time of pruning will give best results, a slight deviation one way or the other will make but little difference, and the conditions may make it a rational one.

The methods here recommended have been found valuable in our own

orchards and are used by the most successful fruit-growers of the state. Believing that no iron-clad rule will answer for all cases we have frequently outlined two or more methods of procedure and, as we have stated the conditions that would influence our selection, trust that the grower will have no difficulty in making a rational choice.

THE PEACH AND ITS CULTIVATION.

While it is probable that the peach was grown in Michigan at a much earlier date by the Indians and the early French settlers, the first well-authenticated planting of peach trees in the State was by a Mr. Burnett in Berrien county about 1809, some of which were alive in 1830.* As early as 1835 the peach crop of Berrien county began to be of commercial importance locally, and in 1839 the first peaches were sent to Chicago market from St. Joseph. From that time the planting gradually increased, not only in Berrien county, but it extended northward along the shore of Lake Michigan and in favorable locations in the interior counties. In 1874 there were more than 650,000 peach trees in Berrien county, but the scourge of the "yellows" destroyed most of the orchards and spread into the adjoining counties. As a method of holding the disease in check has been found, confidence in the crop as a commercial venture has returned, and in the county of Berrien alone it is estimated that 200,000 peach trees will be planted in the spring of 1894, while large areas will be set in other sections.

In favorable locations the peach has shown itself a profitable crop, and in the words of C. D. Lawton of Lawton, "It is an undoubted fact that the production of peaches in Western Michigan, when circumstances are favorable and the cultivator skilled in his work, is one of the most profitable branches of agricultural industry pursued in the United States," while another well known Michigan horticulturist has said in speaking of this fruit: "The peach is the most delicious, the most beautiful, and the most profitable of all our fruits, and nowhere on this continent is it grown to greater perfection than here in Michigan."

By the "Michigan peach belt" a tract from five to ten miles in width, extending from St. Joseph to Grand Haven, was originally meant, but the "belt" has in recent years both lengthened and broadened. as some of the orchards that have been most profitable are located in Oceana, Mason and Grand Traverse counties, and even as far north as Charlevoix (Lat. 45° 30′) they are grown with considerable certainty. Not only are there orchards which have produced profitable crops in favorable locations scattered all over the lake shore counties, but they can be found in nearly every county south of Montcalm (Lat. 43°), and during the past few years the climatic conditions have been such that, in many sections in the interior of the State, the crop has been nearly as sure as in the famed "peach belt" itself. It must be understood, however, that these orchards are in exceptionally favorable localities and that while they may succeed upon one acre, there will be a thousand where not only the crop, but the trees themselves will be destroyed in any except the more favorable seasons. With a proper selection of a location, especially if the ameliorating influence of Lake Michigan can be secured, with a suitable elevation, a

* Winslow's History of St. Joseph.

well drained and properly fertilized soil, and intelligent treatment of the orchards, a crop can on an average be expected in two out of three if not three out of four years. The crop is, therefore, not absolutely a certain one, and judging from the past we may occasionally expect a winter in which, even in the peach growing sections, the peach trees except in unusually favorable locations will be badly injured, if not killed outright.

HARDINESS OF THE PEACH.

While the peach is classed among the tender fruits, it is only relatively so, as, if in good condition, the fruit buds of our best commercial varieties can withstand for a considerable length of time, a temperature of twelve or fifteen degrees below zero, and instances have been known where peach trees have been subjected to eighteen or twenty degrees, for a short time and a fair crop secured the following summer.

In a location adapted to peach culture and with hardy varieties, it is not the extremely low temperatures that are to be feared, so much as the entering on the winter with trees in an unripened condition, or the injury likely to follow the swelling of the buds, during a warm spell in winter, while in some localities the danger from late spring frosts is even more to be dreaded. Among the other conditions that will greatly affect the amount of injury done by cold, are the circumstances under which the trees are thawed out. If after a very cold snap, when the thermometer has gone as low as minus eighteen or twenty degrees, the sun comes out bright and an immediate and rapid rise in temperature ensues, the fruit buds will almost invariably be destroyed, and the trees themselves may be seriously injured; on the other hand, if the sun remains clouded and the trees are slowly thawed out, many of the buds may, if they were in perfect condition, escape. Little, if anything, can be done to secure a gradual thawing out of the trees, but an earnest effort should be made to so handle the orchard that the trees will enter upon the winter in as perfect condition as possible. So much depends upon the effect of elevation and exposure, that the intelligent fruit grower will make a thorough investigation into the climatic condition possessed by a certain locality before selecting it as a site for a peach orchard.

A section of a bud that is in a perfect condition compared under a microscope with one from a bud in which development has commenced, will show how it is that one may escape while the other is injured. The dormant bud has its scales folded closely together but, in the one that has started, they have a loose open appearance that causes them to feel the effect of the slightest change in temperature; on the one hand they are easily chilled and, on the other, the thawing out will be so rapid that injury will almost certainly ensue. While the structural condition of the bud itself has much to do with its ability to withstand cold, it is probable that the main reason why the dormant bud is less susceptible to cold is that the vital functions of the tree are at rest while, after the buds have commenced to swell, the cell contents are in an active condition and the amount of water they contain is much increased.

INFLUENCE OF LAKE MICHIGAN.

The fruit growers in the western part of the State, with orchards within one to ten miles of Lake Michigan, have a location that is particularly

favorable. During the month of February, when as a rule the temperature is lowest, and there is the most danger from severe cold, the record for twenty years shows that the average temperature at Ludington is about the same as in Branch and Hillsdale counties, and "careful records kept for several years at Traverse City and Northport show that the mean temperature during the winter months is several degrees higher there than at Ann Arbor" (Sanford Howard, Report State Board of Agriculture for 1867).

The *lowest* temperature to which the thermometer falls is, however, of more importance than is the *average* temperature and, in that respect, the lake, so long as the breezes are from the west, has a marked effect in keeping the temperature above zero. Again, in April it is desirable to have the growth held back as long as possible in order that the buds and blossoms may not be injured by late spring frosts. The observations of the Weather Service show that for the month of April, the average temperature at Grand Haven is about the same as in Roscommon county, nearly one hundred and fifty miles farther north, while in May the isotherm of Grand Haven crosses the center of the State at Otsego county, or two hundred miles north of its initial point in the State. The lowest limit at Traverse City is about eight degrees F. higher than at St. Louis, Mo., which we think of as well to the south. The prevailing cold winds in winter are from the west and, before reaching the "peach belt," must pass over Lake Michigan, which is unfrozen in the coldest weather. It can be readily seen that the cold winds coming across the plains to the westward at a temperature of from 30 to 40 degrees, when they reach the lake with a temperature from 60 to 70 degrees warmer, will be considerably ameliorated in passing over the eighty or ninety miles of open water between the shores. In fact, the effect produced in extremely cold weather is often as much as twenty-five degrees, so that when it is twenty-five degrees below in Wisconsin, it is not likely to be zero at the same latitude in Michigan. A glance at the map will show that to escape its influence, a wind must come from some point to the east of north, from which direction extremely cold winds are almost unknown. The waters of Lake Huron and Lake Erie have a slight influence upon the temperature, as is shown by the isothermal charts.

A third effect of the lake is to delay the occurrence of the frosts in the autumn, thus giving grapes, peaches and other crops an opportunity to ripen. Although the average temperature of the spring and early summer is somewhat lowered by the influence of the cold water of the lake, it has the reverse effect during August, September and October, so that the average temperature of those months is about the same at Traverse City as in Eaton and Clinton counties.

ELEVATION AND EXPOSURE.

Except in the southern part of the Lake Shore "peach belt" (and even there it should not be entirely overlooked), it is of the utmost importance that proper regard should be paid to the selection of a site for a peach orchard. While we generally speak of elevation as being desirable, it is in a relative sense, principally, that it is of value, as a location upon a hillside where the land slopes off gradually to a valley one hundred feet below is far preferable to one on a level plateau, even though it be two or three hundred feet higher. Cold air is heavier than warm and, if the conditions

are favorable, it will sink to the lowest possible level. A slope of a few feet, down to a little pocket-like depression, will be of but little value as this will soon fill with cold air; what is needed is a depression of considerable breadth or depth, or, if it is only a narrow valley, it should lead into another one into which the cold air can have uninterrupted flow. For this reason it is always desirable to have a stream, even though it be but a small one, flowing through the lower ground. Judge Ramsdell, of Traverse City, in "Michigan and its Resources," mentions a well authenticated case where a difference in temperature of eleven degrees was noticed in fourteen feet elevation, where the lower level was in the form of a pocket, but on his own farm he notes one instance of a difference of ten degrees in one hundred feet elevation, where there was a gradual slope towards Traverse Bay. As he well says, "A hundred feet elevation, with open air drainage to lower levels may determine the difference between a crop of fruit and a ruined orchard; and in enclosed valleys, or basins, twenty feet may do the same." The truth of this can be seen when it is understood that peach buds will withstand a temperature twelve or fifteen degrees below zero, while the trees are often killed at twenty-five degrees below. As a rule a hillside is preferable to a hilltop, as a location for a peach orchard, especially if the latter is of considerable extent, and level, both on account of the better air drainage, and because the trees will be less exposed in severe wind storms.

Regarding the best exposure for a peach orchard, it is not possible to offer any set rule, as the seasons and the locations vary to such an extent that it would not apply in all cases, and in all seasons. In one year a north slope will give better results than one with a westerly exposure, while the next year it may be reversed. The following general statement may, however, aid the prospective planter of a peach orchard. While a westerly slope has its advantages, near Lake Michigan, as the influence of the water is more marked on that side than on the other, it has the disadvantage of exposing the trees to the full force of the wind and sleet storms from that direction, which often cause great loss both of trees and fruit. The south slope is seldom advisable, as there the temperature often rises so high in bright days in winter, as to swell the buds, which are then likely to be injured by the first low temperature; moreover, and this is perhaps the more common cause of injury, the buds start earlier in the spring, than on the north slope, and are more likely to be destroyed by spring frosts. Another objection to the southern exposure, and one which also applies to an eastern slope, is that the early morning sun will more quickly thaw out the frozen buds, than it will when the trees are planted on the north or west side of the hill. We can only take the average of the seasons and say that in sections, within ten miles of the lake shore, where there is no intervening elevated land, the first choice seems to be the westerly and the second the northerly exposure, followed in order by the slopes to the east and south. In the southern portion of the state, away from the immediate influence of Lake Michigan, there seems to be but little choice between the east and west slopes, but the concensus of opinion among fruit growers seems to place them in the above order, except that, for some of the late sorts that barely ripen, the westerly slope is generally chosen. As stated above, the climatic conditions of a certain season may make one of the exposures, for the reasons given, by far preferable to either of the others, while the following winter may be so different, that the slope which was least adapted to success the previous year will give best results, and the proper course to pursue

then is to select the exposure which, everything else being equal, has given best results for a term of years.

THE SOIL AND ITS PREPARATION.

The location and exposure have so much to do with the success or failure of a peach orchard that they are considered here, before the matter of soil is taken up. This seems to be eminently proper, as, while a variety of soils will give good results, peaches cannot be grown with success unless they have a suitable location. It is often said that any good corn or potato soil will do for peaches, but while this may be true it is well to be more explicit. The ideal soil for peaches is a well drained, rich sandy loam. Not only is it as well or better adapted to the growth of the tree than any other, but they are more sure to bear, will ripen earlier, and the fruit is larger, of better quality and superior in flavor to those grown on a clay, or clay loam.

Peaches are very susceptible to the presence of water at their roots, and unless the land has thorough natural drainage, it should be freed of its surplus water by means of tile drains. The fact that heavy soils are likely to be somewhat wet, owing to their having an impervious hard pan, is another reason in addition to those above given, why peaches are preferably grown on a light soil. If well drained and at a suitable elevation, good results can, however, be obtained on a clay soil.

While a location where the land is in sod can be selected and the trees set the same season, it is better to give at least one year to preparation, using the land for some hoed crop. If it can be secured, a clover sod turned under in the Fall is excellent for an orchard, or for any fruit crop. On light soils where the sod is thin, it can be brought into fair condition for the trees if plowed the Fall previous to planting. Before the trees are set it will be well to replow, although a thorough dragging will answer.

Except in very favorable locations, it is hardly safe to set peaches on new land where there is much vegetable matter in the soil, as it is likely to cause a rank and late growth, which is likely to be winter-killed. After one or two crops have been taken off from the land, the trees can be safely planted. Another reason for delay is that the soil is so light, owing to the presence of the partially decayed roots and leaves, that unless care is taken to obtain clear loam to pack around the roots, the trees are likely to dry out. The leaves and other litter, however, are excellent to place around the trees, upon the surface, as mulch.

METHODS AND DISTANCES FOR PLANTING.

When only a few trees are to be set, the holes can be dug with a spade, but for a large orchard, labor can be saved if two furrows are run so as to open up all of the rows in both directions. This will allow the trees to be set at the intersections of the rows, without the labor of digging the holes by hand. The trees may be planted at various distances and be arranged in several ways. When planted in squares, some growers place the trees as close as sixteen feet each way; very few plant at less than eighteen feet, however, and a majority are now setting their orchards with trees at least twenty feet apart, requiring about one hundred and nine trees per acre.

In some localities it is a common practice to plant in rectangles with the trees from twenty by eighteen and twenty by sixteen feet to twenty by fifteen, or as near as eighteen by twelve feet. At the last distance, the

trees, while small, have plenty of room but, after a few years have passed, they begin to crowd. Such close planting is not advisable unless one has an abundance of trees, when it may be economy of space to plant as above, and, when the branches meet, take out every other one so that they will be eighteen by twenty-four feet. At this distance, almost exactly one hundred trees will go upon one acre. With the trees twenty by fifteen feet there will be the same chance to go between the rows one way as when they are twenty by twenty feet, and one hundred and forty-five trees can be set to the acre, or one-third more than when the square is used. After the trees are five or six years old, they will interlace and the crops will be but little larger than would be borne by the smaller number of trees. The same objection will hold against the trees planted twenty-two by sixteen feet, and at either distance it will be more difficult to cultivate than when they are in squares.

A third method of planting, known as the quincunx, or triangular arrangement, consists in arranging the trees in diagonal lines across the orchard, and thus making room for about one-eighth more trees than can be planted by the square method, with the trees the same distance apart.

METHODS OF ARRANGING TREES.

Squares. Rectangles. Quincunx.

This is an increase worth considering, but the distance between the rows will be decreased in the same proportion, and this is a serious objection. It does not hold, however, when the trees are placed twenty feet apart in the rows and the rows are at the same distance. In this way the same number of trees can be set and there will be an increase of about one-eighth in the distance measured diagonally between the trees, which will then be about twenty-two and one-half feet apart. While this distance will be desirable on rich soil, if the orchard is to be on light sand or sandy loam, the other may answer.

In laying out the land, it is a good plan to first stake it off into squares not over four hundred feet on a side. If two opposite sides are marked with stakes, at intervals the same as the proposed distances between the trees, the location of the trees can be fixed by stretching a line or wire marked at the proposed distances, and setting stakes at those points. A No. 14 galvanized wire will be found best for the purpose, as it will not stretch, and the trees can be more accurately located. The points for the trees can be marked on the wire by twisting around it a short piece of small wire and fastening it in place by means of a drop of solder. If a garden line is used instead of a wire, one should be selected that will not stretch, and the distances can be marked by tying short pieces of twine about it. The holes for the trees should be about one foot deep and eighteen inches in diameter, varying with the size of the roots and the character of the soil. The trees should be set sufficiently deep that the

old stock will be covered, and the holes should be deep and wide enough to take in the roots without cramping them. Upon soil with a stiff hardpan, it is well to dig the holes considerably wider than is needed by the roots, as it will give them a better opportunity to develop.

In setting the trees, the soil should be carefully worked in among the roots and firmly packed around them, taking pains by first filling the hole half full of soil, that they are not bruised. The fine surface soil should be used for the lower half of the hole, and then, after the roots have been well covered, if they are partly rotted the sods can be put in, filling up the hole with the subsoil.

The surface should be left level or slightly sloping toward the stems of the trees. The opposite plan of mounding the soil around the trees is not a good one except for fall-set trees, or in localities where mice are troublesome, when they may be banked up in the Fall and the soil leveled off in the Spring.

SELECTION OF TREES AND VARIETIES.

One of the pivotal steps in peach growing is the selection of the trees and the varieties, as, however well the location may be chosen, or with what care the orchard may have been handled, there will be no fruits to reward one's toil unless a judicious selection has been made.

If the grower has the necessary knowledge and can wait two years for his trees, it will be as well, perhaps, if many trees are wanted, for him to propagate them for himself, but the average person will do better to purchase his trees of a nurseryman, who knows how and has the time to grow and care for them in the best manner. Everything else being equal, it is better to obtain nursery stock of all kinds from a nurseryman in the same locality, or where the soil and climate will be similar to that of the orchard. If purchased near home it will enable one to select the trees in the nursery, and there will then be a better opportunity to get trees that are satisfactory. In case the local nurseries are not patronized, the next best thing is to write to some of the large nurseries of this or adjoining states, giving the number and age of the trees, the names of the varieties desired and any other facts, and ask for prices. Before giving a large order it will be well to have samples sent on for examination, and if everything is satisfactory the trees could then be ordered from the man who furnishes the lowest estimate, with a fair degree of safety. With all nurserymen, however, this will not be a safe thing to do, as a low price may mean inferior or worthless trees, and (although there should be a distinct understanding that there is to be no substitution) inferior varieties. If one is familiar with the standing of the different firms, and if the samples are satisfactory, it becomes a plain business transaction, and the trees ordered will be most likely true to name and up to the standard in size and general appearance.

Many person advocate the purchasing of trees from local tree agents who are known to be honest and reliable, but if a large number of trees are wanted you can obtain them from the nurseryman, at as low a price as can the agent who must charge for handling the trees, and besides, since they must pass through the hands of a third party, there is the increased risk that the varieties are incorrect, or that the trees will become dry, or injured in some way. The fruit grower has little use for the average traveling tree agent; although many of the so called tree pedlers are honest, understand

their business and sell trees true to name and at fair prices, the proportion is very small. Too often they fill orders for new and high priced varieties, with seedlings, or with cull or surplus stock, made up of any and all varieties purchased from some grower. As a rule his prices for trees of standard varieties are from two to five times what they can be obtained for direct from the nurseryman, and the novelties, many of which are frauds on their very face, have not been sufficiently tested to determine their value, and are seldom worth the price charged for them. While the large grower cannot, as a rule, afford to get his trees from a tree agent, there may be instances, when only a few trees of common sorts are wanted that the order can be given with safety, if the agent is known to represent a reliable firm, and the trees can be obtained as cheaply as when obtained direct and the carriage paid. The general rule can be given, that it is unwise from a commercial standpoint, to order from an agent a novelty of which nothing is known, except what can be learned from the gorgeous plates he shows, and his lauding words.

It has been stated, that it is well to purchase trees grown in a similar climate and soil; this is not because other trees may not be as good of themselves, but because trees placed under conditions unlike those under which they have been grown, are obliged to accustom themselves to the changed conditions. This is especially true of trees grown in a warm climate, where the soil is rich and moist, and carried to a cooler climate with a short season and a dry sandy soil. The original growth will be soft and watery, and with the usual amount of roots found on nursery trees it will be found necessary to cut the top back severely, thus giving an added check to the trees. It is not uncommon, when the large, bare stem is exposed in this way, for the bark to be burned, and if the tree recovers at all, it will not be for several years. These conditions and results are more common with the cherry and pear than with the peach.

AGE AND SIZE OF TREES.

A tree one year from the bud is of the proper age for planting, and anything older should be rejected at any price. In digging a two year old tree all of the branching roots are cut off, and when set out it does not recover itself until the second year, by which time a vigorous one-year tree will have caught up with it, and will soon outstrip it. A medium-sized tree is best to plant, a large tree with its soft, watery stem and branches being rejected for the reasons given above. Trees whose small size is owing to a poor soil, or unfavorable season, may, if placed in good soil, make a satisfactory growth, but it is often the case that the small size of cull trees is owing to some inherent weakness in the stock or cion, and although they may in time outgrow it, the slight saving in price is not enough to insure the risk.

Of fully as much and probably of more importance than the size and shape of the top is the condition of the roots. They should be well branched and the divisions should not be less than six inches in length. While this will not be the entire length of the roots in trees one year from bud, the tissues of the roots will be so soft that rootlets will readily be sent out.

CARE OF THE TREES BEFORE PLANTING.

If a grower raises his own trees they should be dug in the Fall and carefully heeled-in, in some well drained place, convenient to the orchard site

The trench should be dug one foot deep and two feet wide, in which the trees should be placed, slanting toward the south at an angle of 45°. If placed in single layers so that the soil can be thoroughly worked in between the roots, they will come out in the Spring in good condition.

Care should be taken to select a spot free from stubble or other litter, and no straw or hay should be used to cover the trees, as it would invite the field mice which might work havoc with them. If in a wind-swept spot it would be well to cover the trees with evergreen boughs, or to provide some similar windbreak, but it is hardly advisable to bury the trees in the soil. If the trees are purchased, it is best to obtain them in the Fall and heel them in, as above described. By thus doing, you are more likely to get the first pick of the trees, while if left until Spring the desirable varieties are likely to be sold out, and only culls left. Besides in the rush of the Spring packing there are more chances of errors occurring and the packing may be put off until the buds have started, and a delay in transit is more likely to cause the trees to dry out, or heat, than in the cool weather of late Fall.

Whether purchased, or grown, precautions should be taken not to expose the roots to the sun, or drying winds. Blankets, tarpaulins, or straw should be at hand to cover them, and if to be left any length of time when there is danger from either sun, wind, or frost they should be heeled-in. It frequently happens that trees become dry or shriveled in transit, so that if planted in that condition a large part of them will be lost. If not too far gone, the bark and buds can be induced to fill out so that the tree will be far more likely to grow, if it is buried tops and all for a week or ten days in moist soil.

When trees are shipped any distance, a considerable saving in the cost of boxing and freight would result if they are trimmed before they are packed. The nurseryman can do it as cheaply as the planter, and a saving of from two to five dollars can be made on each thousand trees, if they are pruned as described later on.

SELECTION OF THE VARIETIES.

In making out a list of varieties of peaches for planting, the first consideration should be the hardiness of the trees and of the buds. Many of the kinds that are spoken of as shy bearers are so only because the fruit buds are so tender that in an average year they are destroyed; of course such kinds are of little value and should not be considered in selecting varieties, especially for a commercial orchard. Many of the kinds that are valuable in the States to the south of us do not mature in Michigan and all such should be ruled out. Whether for home use or market a list should be chosen that will furnish fruit in succession throughout the season.

The varieties should be regular and abundant bearers, and the fruit produced, of good size and showy in appearance. The flesh should be firm enough to ship well, yet fine, juicy and melting, and of a rich, luscious flavor. For most markets a free-stone peach is desired. While a variety with yellow skin and crimson cheek is very attractive those with white and red are perhaps equally valuable. A moderately thick skin is desirable in a peach for distant shipment, but its quality is to the same extent lessened, while a thick fuzzy covering is in no way of value and detracts much from the value as a dessert fruit and for market purposes. As is the case with most fruits, it is impossible to combine all of these qualities in a high

degree in a single variety, as, if they are of high flavor, rich and melting, they are generally deficient in hardiness.

One of the difficulties in offering a list of fruits, is, that sorts which succeed well in one locality do not seem to thrive in another. If the most successful fruit growers in the State were asked to furnish a list of their most profitable varieties, the ten sorts having the most votes would be: Hale, Lewis, St. John, Richmond, Barnard (or Snow's Orange), Jacques, Gold Drop, Late Barnard, Hill Chili, and Smock.

Although the above varieties have been found to succeed quite generally, attention should be paid to the character of the soil, in making out a list for planting.

Hill Chili needs rich, well-drained soil, as, if planted upon light sand, the fruit will be undersized, and upon cold, wet land they are very fuzzy, and late in ripening.

The Barnard is another peach that needs a fairly rich soil, but it does better upon one that is of a sandy rather than of a clay nature.

Conkling and Wager seem to thrive upon a rather heavy soil, while Hale, Lewis, Jacques, Gold Drop, and Smock are generally fruitful upon either sand or clay.

As varieties for home use that are of rather better quality, but less hardy in fruit-bud, Honest John, Mountain Rose and Oldmixon may be used, and in favorable locations they will be found good market sorts.

Salway is an excellent late variety but should not be planted except in favorable localities, as it requires a long season. These kinds with, if desired, a few Alexander (or Waterloo) and Early Rivers for early sorts can be generally relied on in all parts of the State, where any of the varieties will grow. The following lists for orchards of one thousand trees have been submitted by the well-known, successful peach growers, whose names are prefixed:

J. N. Stearns, Kalamazoo: Hale Early 50, Lewis 50, Richmond 100, Barnard (or Snow's Orange) 100, Jacques Rareripe 100, Kalamazoo 300, Gold Drop 200, and Smock 100. J. F. Taylor, Douglas: Wilder 25. Rivers 25. Hale 25, St. John (Lewis or Mountain Rose) 100, Early Barnard 100, Jacques 100, Late Barnard 100, Hill Chili 100, Bronson 100, Engle Mammoth 100, Gold Drop 100, Smock 100, Allen 25. A. Hamilton, Ganges, recommends the following: Waterloo, Rivers, Hale, St. John, Barnard, Early Crawford, Engle Mammoth, Bronson, Hill Chili, and Smock. "I would omit Late Crawford, because it is a shy bearer, and let Engle Mammoth and Hill Chili take its place." It will be noticed that none of the large yellow peaches of the Crawford class, such as Early and Late Crawford, Foster, Red Cheek Melocoton and Susquehanna are included, and the fruit grower will say that they are such shy bearers that he can get five bushels of almost any of the kinds recommended to one from the Crawfords. While they are excellent in fruit, there are few if any sections of the State where they are sufficiently reliable to merit their being planted upon a large scale as market sorts.

There are a large number of new sorts that have been sufficiently tested for us to say that they are worthy of planting, but from our present knowledge they can hardly be placed in a short list. The most promising are: Kalamazoo, Elberta, Engle Mammoth, Beer Smock, and Crosby. Other varieties that have a local reputation are Brigdon, Corner and Gudgeon. While several of these are undoubtedly seedlings it is quite likely that others are old varieties whose names have been lost. Several growers

who have watched them carefully are propagating and planting them exclusively. C. Engle, of Paw Paw, also has a large number of new sorts mostly seedlings of Hale, Crawford and Chili that in some respects are better than the parents, and are being watched with much interest. From its behavior with its originator (J. N. Stearns), the Kalamazoo promises to be one of the most profitable peaches, and is certainly worthy of a trial on a somewhat extensive scale.

WATERING THE TREES.

As generally applied, the water given to trees at the time of, or after transplanting, does more harm than good. If the roots of the trees are not exposed to drying winds and if the soil is not unusually dry from a prolonged drought, no water will be necessary. If, however, the soil is dry, it will be well to give a thorough watering at the time of transplanting. This can best be done by filling the hole half full of soil and working it around the roots as recommended above, except that less care is required than when no water is to be applied. Then fill up the hole with water and after it has soaked in, the planting can be completed. The water will not only moisten the soil, but will puddle it in around the roots much better than could be done in any other way. As a rule no other watering will be necessary, but if it becomes desirable it should be done in much the same way, the soil being drawn back from around the trees so as to form a basin for the water, and after it has soaked in the soil can be replaced.

The stirring of the soil of itself will be a benefit to the tree and if applied in this way it will soak down to the roots where it will be of use. As generally applied none of the water reaches the roots, and although it may benefit the tree for a few days by checking evaporation from the soil, it soon dries out and, a crust forming, the evaporation is increased and more harm than good is done to the tree. The one thing that is most necessary, to secure growth in a tree, is to so conserve the moisture in the soil that at all times it is present about the roots. As all the food taken from the soil by the root must be in a solution, the importance of this can be seen. If a crust can be prevented from forming, the evaporation will be decreased and any light, open material spread over the surface will add in the retention of the soil moisture. A mulch of almost any vegetable matter is excellent for the purpose, and waste hay, straw, or corn stalks are often used. They have one serious fault, as they induce the roots to grow in the moist, surface soil, and for this reason are not desirable with the peach and other trees that are liable to injury during the Winter.

The orchardist has, however, a mulch at his disposal that is easier to apply than those mentioned above and it in every way is preferable. It is secured by stirring the surface soil to the depth of perhaps two inches, once in a week or ten days during the dry weather. In the early Spring, when the ground is full of moisture it is well to aid in drying out the surface by working to the depth of three or four inches, but later on when the opposite condition is necessary the depth should not be over one and one-half to two inches. If some shallow-working tool is used during a dry Summer, it will be found that, although the surface soil which has been loosened has lost its moisture, the underlying soil in which the roots feed has been able to retain its moisture by the mulch-like action of the surface soil.

If for any reason it is not possible to give the care outlined above, a mulch should be put on covering a space at least three feet more in diameter than the hole dug for the tree. This should be left on until the middle of August when it should be removed to allow the trees to ripen off for Winter. In localities where field mice are not troublesome the mulch may be replaced around the trees as soon as the ground freezes, but otherwise it is not safe. While some hoed crop can be grown in a young orchard for two or three years with little injury to the trees, it is not advisable to use those that will require much stirring of the soil to harvest them, during August or September. For this reason the potato is not a good crop, except in case of late varieties that are not harvested until after the middle of October. Corn, late cabbages, squashes, tomatoes, melons and similar crops that need cultivation up to the first of August, or that will allow the trees to be worked up to that time, should always be chosen, and in no case should anything be grown within three feet six inches of the trees and if given four or five feet it would be better for them. For the reason that the trees cannot be cultivated, a grain crop is not advisable. It is a mistaken idea that cultivation will cause a late growth and consequent winter-killing. Improper cultivation may do it, but, as recommended above, there need be no fear. If a strip four feet wide on each side of the rows is kept cultivated, the remaining ground may be seeded down, the first year or so. Fruit trees, like most other plants, make their growth during the early part of the season, the period during which the branches of any one kind of tree elongates, varying with the character of the season, as influencing the food supply. When very dry, during the month of July, the trees stop growing prematurely and at once begin to ripen their wood for the writer, storing up in the meantime materials for the next year's growth.

If, after this period of partial rest, the climatic and soil conditions are favorable to a renewal of growth, *i. e.*, warmth and moisture present—the buds that should remain dormant until the following Spring will expand and a second growth will ensue. In this way we can account for the blossoming of peach, plum, and other trees in September and October. The wood thus formed will not ripen properly and the buds will be so imperfectly developed that the growth the next Spring will be very weak. The regular and uninterrupted stirring of the soil during the months of May, June and July will conserve the moisture and tend to prevent a premature cessation of growth.

If not continued later than the tenth to the fifteenth of August, the wood will have an abundant time to ripen and there will be no danger either of unripened wood, or of a second growth. As oftener practiced, however, cultivation may do harm. The orchards are worked during May and June, but, as the other work is pressing, no cultivation is given during July and August, until, as the ground is getting weedy, it is dragged in September; a drouth in July will stop the growth before it is completed and the late cultivation joined with warm rains will almost surely promote a second growth to be injured by the Winter. In a general way, the cultivation should be about the same, during the next one or two years, as for the first year after planting, but after the fourth year, at latest, it is hardly advisable to crop the land unless the trees are at least twenty feet apart. In some localities, it is a favorite practice to sow rye broadcast, the last time the ground is worked in August and turn it under the following spring. It is claimed that the growth of the rye aids the trees in ripening off by

taking from them some of their food supply and thus lessening the danger of a second growth. It also admits of later cultivation. The decomposing rye will add nothing to the supply of plant food, but it will place in the soil a considerable amount of humus in an available form for the use of the plant, and will be of value in lightening up a heavy soil. Especially in the dry seasons and for bearing trees of late varieties, it is well to keep up cultivation until the end of August as the moisture thus conserved will increase the size and hasten the ripening of the fruit. With kinds that tend to overbear, such as Hill Chili and Gold Drop, moderately late cultivation will enable them to carry a much larger crop and develop them to a good size, than if there is no cultivation after the first of August.

PRUNING AT TIME OF TRANSPLANTING.

As a rule if the trees have been properly dug, the roots of one-year old peach trees will need but little pruning. At best, the roots that have been bruised or broken, should be smoothly cut off, and it is generally well to smooth off the ends of all roots over one-fourth of an inch in diameter that have ragged ends. While by no means necessary, it will hasten the callousing and thus enable the trees to throw out roots earlier inthe season. It will be best to have this done in the Fall as it will enable the trees to form the callous during the Winter. In fact, if trees are dug in the Fall any cutting of the roots in the Spring may do more harm than good. The pruning required for the top of the peach is unlike that required for any of the other fruit trees, except such as are also planted when one-year old, when it would be the same. Nearly all growers now cut back their peach trees to a single stem, removing all branches close to the stem and cutting this off about one foot above the point from which the lowest branches are to start. The strong axillary buds will then develop into vigorous shoots. A modified form of this pruning is to leave four or five of the branches arranged at intervals along and around the stem, cutting them off so that one strong bud will be left on each, while others go still further and cut the branches so as to leave five or six with a length of about six inches. Although good trees can be grown from either method of pruning, the first is preferable, as the growths made will be stronger than they would be by either of the other methods. For nearly every situation it will be best to start the trees so as to form a moderately low head, and if the first branches are two to two and one-half feet from the ground it will be in accordance with the methods of the best orchardists.

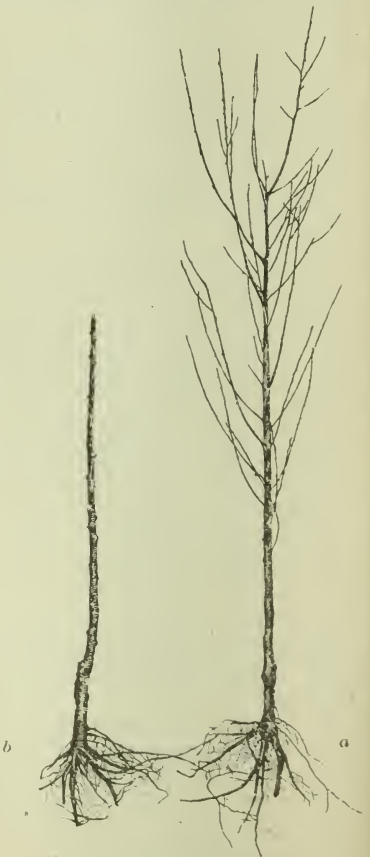

FIG. 1.—NURSERY TREES.
a unpruned. *b* pruned.

If started with low heads, the trunks will not only be short but they will be shaded from the hot sun and less likely to be injured by the freezing and

thawing of Winter. Short trunks will bring the branches nearer the ground and will facilitate the pruning, thinning and gathering of the fruit. The low heads should not be carried to the extreme of starting at the ground, as this would hinder proper cultivation and favor the workings of the borer.

FORMING THE HEAD.

Some growers after heading the trees in, do not attempt to do anything towards forming the heads until the following spring, allowing them to grow as they please during the summer unless they become quite noticeably misshapen, while others go around occasionally and rub out the surplus shoots. In the spring the head is formed by selecting four or five strong branches so located as to be well distributed along the stem for a distance of one foot down from the top and pointing in different directions, thus forming a well balanced head. A strong branch with an upright tendency should be selected as a leading shoot. It will be found preferable to have the branches somewhat distributed, as they will be less likely to break down later on than if they were all crowded together at one point. The side shoots that are left should be cut back about one-half their length. The leader should be kept somewhat longer and trained so that other branches will be given off from it. If this is done it will be found much better than to have all the branches needed to form the head developed as side shoots from those left upon the tree when the head was first formed.

FIG. 2.—PRUNING AT END OF TWO YEARS.

PRUNING THE TREES.

After the first year, as a rule, only one annual pruning is given although if any shoots are noticed that are out of place, it is well to remove them at any time.

The spring is considered to be the best time for the pruning of the peach, and for that matter of all trees, the work being performed after the severe weather of winter is over. For the best results a peach tree can carry about so many branches and so much fruit and to secure this, one of the following two methods of pruning is commonly employed, the first being to head back, the other to thin out the small branches. By heading back the branches a low, rounded and symmetrical tree is secured, upon which the fruit can be readily thinned and picked; the buds remaining will develop a few, strong shoots, well back towards the base of the branches, the tree will be less likely to break down and the stem and main shoots being sheltered from the sun, will be more vigorous and healthy,

and consequently the trees will be long-lived. When pruned by the other method, the small branches along the shoots being removed, there is only a brush-like tuft of twigs at the ends of long slender branches. As a rule growth takes place from a number of weak buds near the end of the branches, and the shoots thus formed transmit their own weakness to those to which they give rise. The fruit being formed at the extremi-

FIG. 3.—PRUNING BY HEADING IN.

ties of the pole-like and comparatively weak branches, the weight, with the increased leverage, often breaks them down. The sap must pass the entire length of the branches before it reaches the fruit, and the amount of plant food provided will consequently be less than when upon short-branched trees, with a comparatively large amount of sap wood, since the fruit buds are formed on the last year's growth. When the heading-back method is used much can be done toward the thinning of the fruit, and, for that reason, it should be delayed as long as possible in order to obtain a correct idea of the condition of the buds, and thus prune judiciously. If all of the buds have been destroyed, the last year's growth should be headed back severely, leaving only one or two strong buds, in this way keeping the trees in as compact a form as possible. If only a few scattering fruit buds are alive, only the ends of the shoots should be cut back, thus leaving

practically all of the buds to develop, but, on the other hand, if most of the buds are alive, the shoots can be cut back one-half or two-thirds and thus about one-half of the work of thinning the fruit will be saved. While

FIG. 4.—PRUNING BY THINNING OUT.

it is best to prune before the trees blossom, the pruning cannot be used to thin as judiciously as when delayed until it can be determined how much fruit has set.

CROTCHES.

If there is any rule that should be uppermost in one's mind when pruning, it is "avoid crotches," as whenever two branches of about equal size form a fork it can be put down as absolutely certain that in time one, or both perhaps, will break down. If possible, one of the shoots should be cut out while small, but if they occur in large trees it will be safer to cut one of them out and head the other back, so as to cause it to send out side branches than to leave it to break down the tree. In case the pruning has been improperly done and a tree divides above its trunk into two branches of equal size forming a distinct crotch, so that the symmetry would be greatly injured by cutting out one of them, both can sometimes be saved by clamping them together by means of a bolt, thus relieving the crotch from any strain.

CROSSED LIMBS.

A second thing to have in mind is to remove all branches that seem likely to interfere with each other. Although it is less common than in the cherry and pear, the branches of peaches cross each other and become partially girdled by the chafing that ensues. As soon as they show any tendency to cross each other, the one that can best be spared should be cut out. While it is desirable to have the head thick enough to keep the sun from burning the bark of the limbs, and to have the main branches clothed with fruiting shoots back to within four or five feet of the main stem, the mistake must not be made of keeping the heads so thick that the sun cannot get in to color the fruit. When well laden, although some of the centre shoots may maintain their upright position, the side branches will be sometimes drawn down by their load of fruit and the sun can thus get down among the branches. If, however, the branches are so thick as to prevent this, some of the weaker ones should be cut out, in addition to the heading back that is given the others. A pair of pruning shears will be all that is needed for the removal of the surplus branches if the work is not neglected. However, although its excessive use will shorten the life of the tree, a saw must sometimes be resorted to. Whatever method of pruning is employed, the cuts should be as smooth as possible, care being taken not to bruise the bark, or tear it down the stub. While no general rule can be given for the place of making a cut, it can be said that, when cutting back a branch to the main shoot, care should be taken not to leave any projecting spur and the wound should be as small as possible.

As a rule, the cut should start from an eighth to a fourth of an inch from the main branch and come out in about the middle of the thickening which is generally present on the under side. When made parallel with the main branch the wound is unnecessarily large, and it is better to have it made 10 to 15 degrees from a parallel. In heading back a branch the cut should be made at an angle of 45° just beyond a strong bud or branch.

THINNING THE FRUIT.

One of the most difficult things about peach growing is to have the trees properly thinned, as few men without previous experience will remove enough of the fruits even if those left upon the trees are properly distributed. Not only will there be as many bushels of fruit upon a properly pruned tree, as on one that has twice or three times as many fruits, but the peaches being larger and handsomer will sell readily at a highly remunerative price, while others of the same variety, that have been given exactly the same care except that they were not thinned, will be a drug in the market at any price and may not bring enough to pay charges. It is extremely unprofitable not to thin the fruit and it will also be found a short-sighted policy, as the trees will be greatly weakened by the strain of supplying the phosphorus and other mineral elements required for the formation of the excessive number of pits. The large, thinned fruits contain only perhaps one-third as many pits as the others, being largely composed of the flesh which is mostly water. The mineral elements are most likely to be wanting in the soil, and are consequently most difficult to obtain; since they are required in large quantities in the pits, it can be readily seen that the practice of leaving the fruit unthinned is very exhausting to the trees and will so lessen their vitality that the growth will

be checked and future productiveness lessened. If a tree is left unthinned and, particularly, if the summer is a dry one, it often attempts to relieve itself by dropping part of the fruit, and as they are somewhat loosely attached a heavy wind-storm may strew the ground with the half-grown peaches, oftentimes taking nearly the entire crop. While the trees would have been more likely to retain the fruit had they been thinned, there would also have been a much less serious strain to the tree, as the small number of pits formed would take less mineral food. In some seasons the fruit drops badly soon after it has set, from the effects of curculio, curl, extremes of moisture or other causes, and for this reason the thinning should be delayed as long as possible without drawing on the trees too much. If done just before the pits begin to harden, as a rule there will be little loss from dropping after that time. The fruit will be about the size of a natural peach pit, and it will be early enough to avoid a strain to the trees. The time will vary with the season but, as a rule, the 12th to 18th of June will answer in southern Michigan and the 15th to 25th in the northern half of the State. In localities where the rose chafer is troublesome, it will be well to at least delay the final thinning until danger from them is over. In thinning the fruit, no set rule can be given, as it varies with the size and vigor of the tree, the variety, and with the amount (if any) the tree has been headed back. The old rule, when trees were not headed back, was to leave a peach every six inches upon the branches, and it is a safe rule to follow under those conditions, but when the fruit has been partly thinned by heading back it will not answer.

If evenly distributed over the tree, and when the branches are clothed with soft spur-like branches, it will be well, as a rule, never to leave more than two peaches upon any branch unless it is long and unusually strong, and not to have them under any conditions nearer than four inches from each other. On the other hand, if the side branches are not numerous, and if the shoots are cut back very severely the distance may be somewhat lessened and the number increased. In thinning, an effort should be made to leave the peaches as evenly distributed as possible, making due allowance for the size and strength of the branches. The larger fruits and particularly those near the base of the shoots should be left and the others removed. With a little experience, a tree can be very readily thinned, particularly if it has been well headed back, which as noted before will greatly reduce the number of peaches that need to be removed with the hand, and by lessening the height, render the operation much easier, as most of the work can be done from the ground. The length of time required to prune a tree varies to such an extent with the size and height of the tree and with the number of fruits to be removed that no estimate of the expense can be given. It can be safely said, however, that the cost will be several times repaid, to say nothing of the benefit to the trees. If when thinning the trees the peaches are thrown into a basket and burned, a great number of curculio will be destroyed and future attacks lessened. When peaches are properly thinned the danger from rot will be decreased, as it is a common occurrence to have one diseased peach transmit the rot to all others in contact with it, and when crowded together the rot will be much more likely to appear, than when the fruits are arranged singly.

MANURES AND FERTILIZERS.

So much depends upon the condition and natural fertility of the soil that only general rules for the application of manures and fertilizers can

be given. If the soil is in condition to furnish a good clover sod to be turned under no better preparation can be furnished, and frequently it will supply plant food until the trees come into bearing. If the clover sod cannot be secured, and if the soil is not rich enough to grow a good crop of corn, some manure or fertilizer should be applied. The application of ten tons of decomposed stable manure broadcast, before the land is dragged in the spring, will supply food for the growth of the trees and for the crops that may be grown between them; a method of supplying food to the trees, without feeding the other crop and by the use of a comparatively small amount of manure, is to spread three or four forkfuls, evenly over spots four or five feet in diameter, where the trees are to be planted. In any case, it should be incorporated with the soil and not allowed in contact with the roots. While the application of stable manure is advisable for the young trees upon poor soil, rather better results in some respects can be obtained when they are of bearing age, particularly upon soil that contains a fair amount of organic matter, by the use of the so-called mineral fertilizers. It is known that if we supply plants with potash, phosphoric acid and nitrogen they can, as a rule, obtain the remaining elements needed for their growth from the soil and atmosphere. The nitrogen is necessary for all growth of plants, but if present in excess it is likely to cause a soft, watery growth. It is generally present in sufficient quantities in soils of fair fertility to carry the trees up to the bearing age, provided the soil is not robbed of its fertility by other crops. Phosphoric acid is also found in all parts of plants, but is particularly abundant in the seeds, and as soluble phosphoric acid is gradually removed from the soil by successive crops there are few bearing orchards that will not be benefited by its use as a fertilizer. We have at hand materials that supply these elements in a concentrated form, at prices no higher than would be the cost of the more bulky stable manure, when it has to be hauled any distance.

One of the best fertilizers for orchards will be found in unleached wood ashes. They contain all the elements needed for plant growth, except nitrogen, and these are present not only in about the proportions needed by the trees, but they are in combinations that can be readily taken up by them. A good sample of wood ashes should contain about three to five per cent of potash, and one and one-half per cent of phosphoric acid; if they have been leached or washed by rains the amount will be considerably reduced, while in some cases the amount of both potash and phosphoric acid is fifty per cent larger than is given. From a half peck to a bushel of wood ashes per tree, according to the size, can always be used to advantage, and if the trees are large, so as to cover the ground, it will be best to use from 100 to 150 bushels per acre scattered broadcast, covering the entire ground, Since ashes tend to render a clay soil still more tenacious, care should be taken that they are not applied in large quantities upon stiff soils.

Among other sources of potash are the German potash salts, which are imported as muriates and sulphates, and contain varying proportions of chloride of sodium (common salt), and chloride of magnesium. The best grades contain about 50 per cent of potash, and are preferable to the cheaper ones, as the expense of transporting the worthless materials in the lower grades makes the potash cost more per pound than in the higher grades.

From one-half pound to three pounds per tree, or from fifty to three hundred pounds per acre, should be applied, taking care it is not brought in too close contact with the roots. In soils deficient in potash it must be applied

to secure a proper development of the trees and it will also increase the amount of sugar and heighten the color of the fruit.

The best source of phosphoric acid is from bones, either ground, or as bone charcoal. The value of ground bone depends to a considerable extent upon its fineness, and the action will be hastened if it has been treated with acid and rendered soluble, in which case it forms what is known as a superphosphate. Fresh bones contain a small amount of nitrogen which adds to their value. A fair sample of ground bone should contain rather more than 20 per cent of phosphoric acid, of which about one-third can be utilized by plants; while the remaining 15 per cent is in an insoluble form it will gradually become available. The amount of nitrogen in ground bones is quite variable but is seldom less than 2, or more than 5 per cent. In addition to the fresh bones, bone charcoal in the form of dissolved bone-black is also used as a source of phosphoric acid, it containing some 16 to 20 per cent, nearly all of which is immediately soluble. Nitrogen is not present in bone-black, having been removed by the burning. Phosphoric acid is also obtained from various waste products of slaughter houses, from guano and fish scraps and, in less valuable forms, is mined at Charleston, South Carolina, and in Florida, and is found in iron slag. The Charleston phosphate rock is largely used in fertilizers, but its phosphoric acid is less valuable than that from bones. The iron slag phosphate, sometimes known as "Odorless" is highly commended by many who have tried it, although it has some value, the extravagant claims made for it can hardly be sustained. Analysis shows that it contains about 20 per cent of phosphoric acid, of which some 3 to 4 per cent is soluble.

The nitrogen supply, except as furnished incidentally in the bones and waste animal products, is obtained from nitrate of sodium, and sulphate of ammonium. In both of these salts it is readily soluble and is considered more valuable than when from other sources. The quantity of the salts required varies with the character of the soil as well as with the age of the trees. Stable manure is preferable as the source of nitrogen, but if it cannot be obtained and the condition of the soil is such that some form of nitrogen is needed to give a fair growth to the trees, 100 to 150 pounds of either of these chemicals per acre would generally be ample, while a considerably smaller quantity would suffice for young trees. There is much danger if it is used in large quantities, particularly if it comes in close contact with the roots. One can determine the relative value of the various fertilizers as their guaranteed analysis must be furnished, and with this and the value per pound of potash, phosphoric acid and nitrogen it can readily be computed. Potash is reckoned as worth about 6 cents per pound when in the form of sulphate and five cents as a muriate. Phosphoric acid when soluble is valued at eight cents, reverted at seven, and when insoluble in bones it is valued at from three to seven cents, while in rock and similar materials it is only worth from one to two cents at the most, while from some materials it has little if any value. The variation in the value of nitrogen is still greater, as in nitrate of soda it is worth sixteen cents per pound; as sulphate of ammonia eighteen cents; in blood, meat and fish scraps fifteen cents; in bones from ten to fifteen cents according to the fineness of grinding. In stable manure nitrogen would be worth about eight cents per pound. As they are for the most part readily soluble it is best to apply the fertilizers in the spring; if this is done just before the land is to be harrowed it will be better than to plow it in. In seasons when droughts prevail there is less effect from fertilizers than from stable manure,

but, although there may be some loss of the nitrogen and potash, the phosphates will be retained in the soil with little or no loss.

THE RATIONAL USE OF FERTILIZERS.

As nearly all, if not quite all soils contain a considerable amount of lime there will be little use in applying lime in any form for the sake of supplying that element to plants, and the same can be said of sodium and chlorine, and as these elements make up our common salt, it will be seen that salt is of no value to any crop as a fertilizer. Of the three elements mentioned above that are often deficient in the soil, potash, phosphorus, and nitrogen, it can be said that a rich virgin soil will generally contain all that is needed for an orchard, but after the trees have matured several crops of fruit, the available potash and phosphorus is likely to become so reduced that a satisfactory growth cannot be obtained, and if the soil is in any way deficient in organic matter, the amount of nitrogen will probably be rather small. In order to determine what one of these elements and the amount that should be used, it is well to make use of them experimentally, applying, for example, ground bone upon one row of trees, muriate of potash, or wood ashes upon an other, nitrate of soda, if the land is poor, upon a third, and combinations of two and of all of these materials upon still other rows, with a proper number of untreated rows. If the plots have been properly selected, one should be able to tell at the end of the second or third year which of the elements are needed, and if the experiment has been carried on so as to have plots with different quantities of the fertilizers upon them the amount that can be properly applied to each can be learned, and in this way one can be saved the useless application of fertilizing materials that are, perhaps, already in excess in the soil. As a rule, where no experiments of the kind have been conducted, a bearing orchard should have, once in two years, from 300 to 500 pounds of ground bone, 200 to 300 pounds of muriate of potash (instead of the muriate of potash, 100 bushels of wood ashes if unleached, or 300 bushels of leached may be used); 150 pounds of nitrate of soda, or 25 tons of decomposed stable manure, will be beneficial if the soil is light. In addition to their value for supplying plant food, the chemical fertilizers have an additional value, that is perhaps equally important, as, by supplying soluble plant food early in the season, they enable trees to make their growth during the first of the season and ripen their wood thoroughly before winter. The growth is, as a rule, much more firm than that obtained by the use of stable manure, or from the natural fertility of the soil. In fact the chemical manures can be used as correctives since if those containing potash and phosphoric acid are added to soils that have been highly enriched with stable manure, or that are naturally quite rich in organic matter, they will have a tendency to make the new wood more firm and compact. It can then be claimed that the proper use of chemical manures will increase the hardiness of the trees, and will both render the fruit buds less susceptible to sudden changes in the weather, and lessen the danger of their winter-killing.

THE NURSERY CULTURE OF THE PEACH.

While the farmer or village resident will prefer to purchase his peach trees of a nurseryman, it often happens that an extensive grower can at a slight cost in labor, propagate his own trees and thus be more likely to secure the varieties he desires to plant, and to have them free from all taint of disease. There are no secrets in the nursery growing of peach trees that cannot be readily acquired by any one, and, although practice in the various operations will necessarily make one more expert, if the instructions here given are carefully followed any intelligent person can grow peach trees.

SOIL FOR A PEACH NURSERY.

Peaches need about the same kind of soil, whether in the nursery, or in the orchard, although the nursery soil should be rather more fertile, and for propagating peach trees a well-drained, sandy loam should be chosen. A clover sod plowed under is an excellent preparation of the soil, and if the soil is naturally fairly fertile it will need no other dressing. If stable manure is used, care should be taken that it is not applied in excessive quantities, or in an undecomposed condition, as it would probably cause a watery growth that would not ripen, and winter-killing would ensue. If any fertilizer is needed, unleached wood ashes at the rate of 150 bushels per acre, and about 500 pounds of ground bone, will supply the necessary plant food, in anything but an exhausted soil, and a strong, well ripened growth can be obtained. If these are not used and if the soil is deficient in organic matter ten or fifteen loads of decomposed stable manure, spread broadcast and plowed in will greatly aid in growing good stock. As stated above a good clover sod plowed under will be preferable, as it will not only supply the necessary plant food to the soil but it will improve its physical condition. The land should be carefully fitted, as time expended in this will be doubly repaid by the amount saved in the after cultivation.

THE SEED AND ITS PREPARATION.

As in the growing of all kinds of nursery trees, the first thing is to obtain suitable stocks upon which to work the improved varieties. As stock for this fruit, peach seedlings are almost universally used. The plum is preferred as a stock for the peach by the English, when they have a cold, wet soil, and is recommended by some for use under similar conditions in this country, but it is doubtful if there are any soils, or localities, in which peaches can be relied on to fruit, where the plum stock is necessary. Nearly all writers advocate the use of natural pits, or those from seedling peaches, and this is the almost universal custom. The claim is made that seedlings grown from natural seed are more vigorous than from seed of improved varieties. The natural seed owes its value to the fact that all the efforts of plants in a wild state are used in perpetuating themselves, while our cultivated varieties have been so modified by man in his endeavor to increase the amount, or the quality of the flesh surrounding the stone, that the reproductive properties in the seed itself are weakened, the seeds will be less certain to grow, and the trees will be

less vigorous, less hardy, and consequently shorter lived. At any rate as nearly all of the natural seed comes from Virginia and Tennessee where the "yellows" are not known to be, there will be less danger of obtaining the germs of this disease in them, than when pits of improved varieties are used, unless one is familiar with the source from which the seed comes. The pits from canning factories that obtain their fruit from infected districts should be looked on with suspicion. The natural seed can readily be distinguished from that of the improved varieties, as it is smaller, more nearly spherical and lacking the wing that is so noticeable around the edge of the latter; the canals upon the surface of the pits also, are not as large, or deep as in the latter; the halves of the shell are more firmly united and the kernels are firmer and thicker. The pits should, if possible, be obtained in the autumn and although they may at once be planted in nursery rows, it is not the best plan as the pits thus treated are not all of them sure to germinate the first year, if at all, and an uneven stand will result. It frequently happens that when thus treated, part only of the pits sprout in the spring, others appear the following year, and still others may show themselves the third year from planting.

STRATIFYING THE SEED.

In order to secure the prompt germination of the pits, they should be so treated that they are exposed to the action of frost. If only a few are to be planted, they should be placed in thin layers, alternately with an inch or so of soil, in boxes, and after that closed up so that the moisture cannot escape, and placed on the north side of a building where they will be out of the way of the drying influence of the sun. To secure the full action of the frost the seed should be soaked for twenty-four hours before being placed in the box, and it will be well to thus treat the seeds, however they may be stratified. When nurserymen stratify large quantities of seed much the same course is pursued, except that they excavate a trench, ten inches deep and large enough to hold the seed, in some moist but well-drained soil. In this the seeds are placed in alternate layers of soil to a depth of eight inches and covered with two inches of sand. Unless the soil is moist it will be found well to wet the bed down thoroughly before covering it up. Another method is to spread out the seeds upon the surface to the depth of three inches, and then spade them in, taking pains to have them all covered. Treated in either way they will be exposed to the freezing and thawing of Winter and the shells will be so loosened that as the seeds swell in the Spring most of them will fall apart. When the time for planting comes they can be taken out, separated from the soil by means of a screen, and all that have not opened carefully cracked with the hammer. When an even stand is desired and especially in localities where moles are troublesome, another method of stratifying will be found still more reliable. The pits are scattered on the surface in a single layer, forming a bed four feet wide and of the necessary length, and covered with two inches of soil. In the Spring they will be so well cracked that most of them will sprout and send up shoots; as soon as they are three or four inches high they should be carefully taken out and transplanted with a dibble to the nursery rows at intervals of eight inches, placing them so that they will be about two inches deeper than they were in the seed bed. By keeping the plants in pails of water, so that they will not wilt, very few will be lost if the soil is moderately moist. If the

season is very dry it may become necessary to water the plants once or twice.

PLANTING THE SEED.

In case the seed is planted in the fall, or in the spring before it has sprouted, the operation is not unlike the sowing of peas. Drills are made with a marker, or with a hoe if only a few are to be planted, two inches in depth and at intervals of about three feet eight inches, being rather more in rich soil and less in sand; in this the seeds, which have been previously cracked, are dropped about four inches apart. They should then be covered with a hoe or rake and the soil firmly pressed down, using a roller in light soil. From eight to ten bushels of natural seed will be required per acre and with good success this should give twenty thousand trees; as a rule, however, not over ten thousand first-class trees will be obtained from an acre even under the best of conditions. In laying out the nursery, it is preferable to have the rows run north and south and space should be left at each end to give room for turning in cultivating. During the first part of the season, the young seedlings should be cultivated once in ten days and the soil between the plants occasionally stirred with a hoe to keep the weeds down and a crust from forming. The cultivation should be shallow and with an implement with small teeth or shovels. About the first of August it will be well to go over them and rub off the leaves to a height of four or five inches on the stem. In case the season is dry, the cultivation should be more frequent, and if it looks, by the middle of July or the first of August as though the stocks would not reach a suitable size for working, they can be aided by scattering broadcast along the rows, ground bone at the rate of three hundred pounds per acre and a bushel of wood ashes to eight or ten rods of row. Instead of the above, guano or superphosphate could be used. Nitrate of soda is also excellent to promote growth but it should be used very carefully at the rate of not over 100 pounds per acre. They should be thoroughly worked into the soil. If conveniences for watering are handy it will pay, if the drought continues, to give the plants a thorough watering, which will help to render the fertilizer available.

By the last of August the smallest of the seedlings should be as large as a lead pencil and the others will range from that size to a half or five-eighths of an inch in diamater.

BUDDING.

As the object of this operation is to obtain trees of certain desirable varieties, every precaution should be taken that the buds used are true to name. As a rule, they are more reliable if taken from bearing trees, but they are not as vigorous, or as easy to obtain as from nursery trees. If buds from small trees are used, especial pains should be taken, as a mistake with a single bud may make a difference with a hundred or more trees when buds are taken the following year. The buds, above all, should be healthy, plump, and well ripened; as a rule those at both the upper and the lower ends should be rejected. After cutting the bud sticks, the leaves should at once be cut off, leaving the leaf stems about three-eighths of an inch long, as handles to use in inserting the buds; to keep them from drying they should be wrapped in oiled cloth.

As a rule, the budding can be done as soon as the stocks are of a suit-

able size, and when the buds have become firm, but if the growth of the stocks is still very rapid it will be well to delay the operation, as a too vigorous growth may throw out, or cover up and smother the buds. The budding should be completed ten days or two weeks before growth stops, and while it can be performed with good success as late as the first week in October, it is better to have it finished by the middle of September. If the budding is performed early in the season and the period of growth is long, the buds may start into growth and be injured by the winter. In addition to the seedling stocks and cions of the desired variety, the only materials required in budding are a budding knife, and something for binding the buds. The budding knife (Fig. 5, *a*), has a thin, sharp blade with its end rounded so that the point is even with the back. To assist in opening the bark there is either a thin piece of ivory in the other end of the handle, or the tip of the blade may be rounded so as to make it blunt. As a wrapping material raffia, which is obtained in narrow strips from the epidermis of the leaves of a certain kind of palm, is most commonly used, although

FIG. 5.—BUDDING.
a, Budding knife. *b*, Bud-stick and buds. *c*, Bud inserted and wrapped.

the bast layer of bark of the basswood and yarn are preferred by some. The operation of budding consists in making a T shaped cut in the bark of the stock and, after lifting the bark, placing under it a bud from the cion with a little bark attached and binding the bark firmly down upon it. The cut is made within three or four inches of the ground drawing the knife either vertically or horizontally first, as is most convenient. In case the horizontal cut is first made, the knife should be drawn upward to the cross cut when making the vertical incision, and when the two meet a slight twist of the wrist will cause the knife to turn up the edges of the bark so that the bud can be easily inserted. If the horizontal cut is made last, it should be at a slight angle (Fig. 5, *a*) so that the corners of the bark will be somewhat raised from the stock. If the stocks are in proper condition for budding, the bark will be sufficiently raised, to readily admit of the insertion of the bud. If for any reason the bark does not lift, the ivory at the end of the handle, or the rounded end of the blade of the budding knife, can be used to open it. Having made the

stock ready for a bud, one of the bud sticks (Fig. 5, *b*) should be drawn out from its wrapping and a bud (Fig. 5, *b*) removed. In cutting the bud the cion is held in the left hand, resting on the forefinger, with the small end toward the body. The knife is inserted about half an inch below the bud and a cut is then made deep enough to take off a thin shaving of the wood and extending one-half inch above the bud. The cut may be brought out through the bark at this point, entirely severing the bud, but this is likely to cause the bud to fall to the ground. The usual custom is to remove the knife and complete the severing of the bark, by a cut at right angles to the one first made. The shaving of wood taken off with the bark is removed by some budders, but it is not necessary and is sometimes harmful, unless carefully done, as the base of the bud may be torn out with the wood. Then take the stub of the leaf stalk, left for the purpose attached to the bud, between the thumb and forefinger of the right hand and insert it in the slit in the bark of the stock, crowding it down until the top of the bark attached to the bud is below the horizontal cut on the stock. If still loose, it is well to push it down until the bark of the stock presses firmly against the piece of bark attached to the bud. The bud is now ready for tying, which consists in wrapping a strip of raffia or other material that is to be used for the purpose, from twelve to fifteen inches in length, according to the size of the stocks, and from one-fourth to one-half inch in width, from two to four times around the stock beneath the bud, and about twice above it (Fig. 5, *c*), giving it tension enough to press the bark firmly down upon the bud. This pressure of the bark is beneficial in two ways, as by shutting out the air it prevents the bud from drying out, and by bringing the bud and stock in close contact the union is more rapid. The operation of budding is now completed but the tree is by no means ready for the orchard. In about ten days or two weeks the trees should be looked over and if any of the buds have failed to take, new ones can be inserted. In all cases where the buds have taken, the bands should be cut, by drawing a knife across them on the opposite side of the stock from the bud. If one of the folds is cut it will be sufficient, as the wrapping will open of itself. Sometimes the growth of the stock before the bud has taken is so rapid that the pressure of the band will so check the flow of the sap that, if left to itself, the stock would be girdled. Upon all such stocks the bands should be loosened and retied. In case the budding is done towards the close of the season of growth, it is not always necessary that the bands be cut, as there is no danger of constriction and they will decay before spring, but under other conditions it is safer to be sure that the bands are cut. Nothing further is necessary the first year, unless the trees are on rather moist soil, where there is a good deal of freezing and thawing, in which case it is well to throw up a light furrow, on each side of the rows, covering the buds. In the spring this should be thrown away from the rows and the narrow strip between the trees drawn away with hoes. The stocks should then be cut back, the cut being made somewhat slanting, beginning on the side opposite the bud, about half an inch above the bud itself, and giving the top of the stub a slope of about 45 degrees. Sometimes the cut is made several inches above the bud and, later on, after the bud has sent up a stem twelve or fifteen inches high, the stub is cut back near enough the bud to admit its being readily grown over. Cultivation should begin as soon as the soil is in a suitable condition and should be kept up through the Summer until the trees get large enough to shade the ground. In case the season is a

dry one, or if the trees make a slow growth, it should be kept up until the middle of August, using a fine toothed, shallow-working implement. When growth starts, a number of suckers will start up from the stub of the stock. When they get to be two inches long they should be rubbed off, taking pains to remove every portion. As a rule no others will come out but if they make their appearance, they should be promptly removed. The hoe should be used this season sufficiently often to keep the crust between the trees broken. The trees will be of a suitable size for orchard planting in the fall or following spring.

By the first of November, or earlier if most of the leaves have fallen, the trees can be dug. In doing this pains should be taken not to cut the roots too short, as this would lessen the chances of living, and at best will shorten the growth the first year.

JUNE-BUDDED TREES.

In some sections what are known as June-budded trees are grown, but they are of little value except as a means of rapidly propagating new sorts of which buds were not set in the fall. The cions must be cut in the fall, or winter, and kept dormant until the stocks have begun to grow so that the bark will lift. When the buds are set, most of the top is cut off and in two or three weeks the stock is cut back to the bud, which soon breaks and forms a weak growth. In the south the method is used with fair success, but in this State it has few advantages and several disadvantages, the principal one in addition to the weakness of the growth, being that it is likely to make a late growth and be injured by the winter.

THE CULTIVATION OF THE PLUM.

During the past ten years the plum has come rapidly to the front as a desirable fruit for the commercial grower. The success met with by the people of Oceana county in the cultivation of this fruit, and the highly remunerative prices obtained have led to its being largely planted in various sections of the State, and the returns thus far obtained from the earlier plantings, have been very generally satisfactory.

There are many sections of the State in which this fruit can be grown, where the peach will not thrive, and it will undoubtedly greatly increase in value as a commercial fruit.

While the care required by a plum orchard differs in some of its details from that needed by the peach, the general principles upon which we work are the same; we shall therefore treat the subject of plum growing largely by referring the reader to the preceding pages upon peach culture, and merely pointing out the particular points in which the treatment given to the plum should differ.

SOIL AND CLIMATE FOR THE PLUM.

The climate of Michigan seems well suited to the plum, and it is a sure crop in all parts of the State except in some of the interior counties in the

extreme northern part of the lower peninsula and in portions of the upper peninsula, but even there the failure is due more to soil than climatic conditions. While the same general rules regarding elevation and exposure apply to this fruit as have been given for the peach, they vary in degree, and plums can, owing to the greater hardiness of the fruit-buds as well as of the trees, be grown in locations where the peach will fail. In fact it is a common practice, when large areas are planted to these fruits upon rolling land, to use the higher portions for peach trees and to set the plums in the depressions, although if the soil is suitable the plums would do better upon the elevated land.

As a rule it may be said that plums need a strong and rather heavy soil, but on the contrary the most successful plum orchards in the State are in Oceana county, where the soil is light. The soil there, however, is rich in lime and seems well adapted to the growth of the trees and to the production of large crops of fine fruit. For the best results the land should be fairly moist, but success cannot be obtained if it is not well drained. If moisture is present with a proper supply of plant food, fair success can be obtained upon almost any soil, although a light sand, muck or heavy clay should be avoided, with a moderately heavy loam either sand or clay as a choice.

AGE, SIZE AND CARE OF TREES.

In a general way, the same rules apply here as were given for the peach. The ordinary planter will, however, find trees that have been grown in the nursery two years from the bud, preferable to one-year trees.

It may be well to state that plum trees are generally budded upon Myrobalan stocks, (another name for *Prunus cerasifera*, a dwarf European plum). The peach is sometimes used as a stock for American varieties, and is recommended by some nurserymen as a stock for European sorts on sandy soils. Sometimes St Julien stocks are used, and others grown from cuttings of the Marianna (a Texas variety with close affinities to *Prunus cerasifera*), are meeting with favor. The first two kinds may be grown from imported seeds, but it is a more comman plan to plant European grown stocks. They are placed about three feet eight inches by six inches, and if strong may, under favorable conditions, be budded the same season. If not large enough, budding may be delayed until the following year. The season for budding the plum is earlier than for the peach, the operation being performed as a rule either the latter half of July or the first half of August. Other than noted the care of plums in the nursery is the same as for the peach.

In heading back the top of the trees at the time of planting, the common practice differs somewhat from the method pursued with the peach. According to the amount of growth and the amount of root area the branches are cut back from one-half to two-thirds, and the weaker ones are thinned out so as to leave not over five side shoots in addition to the leader, which should be shortened only about one-third. The branches should be distributed upon the different sides of the stem as evenly as possible, taking pains also to secure a vertical distribution. Both extremes should be avoided in fixing the height for the head; three feet from the ground to the lower branches may be taken as an average, although many would have that as the maximum, and under some conditions it would be preferable to a greater height.

The after pruning is confined to the thinning out of unnecessary branches, particularly those showing a tendency to rub against others, and the heading in of rampant shoots. The extremes of either heading in or thinning out as practiced upon the peach do not apply to the plum. A plum tree properly pruned at the time of transplanting will need but little training thereafter and that given should be the least that will suffice to guide it into a symmetrical form.

As is the case with all other fruits, the plum needs thorough cultivation if we would obtain the best results. There is even greater need of fertilizers than with the peach, as the plum does not seem to be as good a scavenger as does that fruit, but if possible it should be in some mineral form. Stable manure can, however, be used under some circumstances to improve the physical condititions of the soil, its effect either upon a light or heavy soil being beneficial.

VARIETIES OF THE PLUM.

Nearly all of the varieties commonly in cultivation belong to the so-called European species, *Prunus domestica*. The better kinds are as follows, arranged in the order of their ripening:

Duane's Purple.—Tree vigorous, shoots very downy, leaves large and downy. Fruit very large, oblong-oval, one side larger, than the other. Stem slender, three-fourths of an inch long, set in a narrow cavity; color red-purplish, red in the sun, dotted with yellow and with a lilac bloom; flesh light yellow, juicy, rather sweet; adheres slightly to the stone even when ripe. Ripens the middle of August. A profitable market sort.

Washington (Fig. 6).—Tree strong growing, forming a round head, leaves large and glossy, branches light brown, downy. Fruit quite large, roundish-oval, suture slight. Stalk five-eighths of an inch long, stout, downy, set in a shallow but wide cavity. Deep yellow with crimson blush and dots, marbled with green before ripe. Flesh yellow, firm, sweet and rich, free. Last of August. One of the best yellow plums.

Bradshaw (Fig. 6) (*Niagara*).—Tree very vigorous, with large, purplish and smooth shoots. Fruit large, ovate, with a stout stem three-fourths of an inch long, slightly inserted in the narrow cavity, sometimes with a slight neck; purplish red with a blue bloom. Flesh yellowish, becoming brownish yellow, rather coarse, but juicy and pleasant. Clings slightly to the stone until fully ripe. Last of August. One of the best of the standard varieties, although the new variety, *Field*, which in many respects resembles it, is preferred by many as it is one or two weeks earlier.

Green Gage (*Reine Claude*).—Trees small, slow growing, smooth shoots, buds with well marked shoulders. Fruit small, with slight suture, round, green or yellowish green, mottled with red in the sun when fully ripe. Stem slender, one-half inch long, slightly inserted. Flesh light green, rich, melting, juicy, luscious, free. The best in quality of all plums. Last of August and first of September.

Lombard (Fig. 6).—Tree vigorous with glossy, purple shoots, leaves crumpled. Fruit of medium size, oval, slightly flattened at the ends, suture indistinct, violet red, with thin, white bloom. Stalk slender, five-eighths of an inch long. Flesh, deep yellow, juicy, pleasant, adhering to the stone. Early September. One of the most productive varieties. While it should be every collection, the immense number of trees of this variety that have been planted within the past five years will tend, by lowering the price, to make it less desirable for planting upon a large scale as a shipping variety.

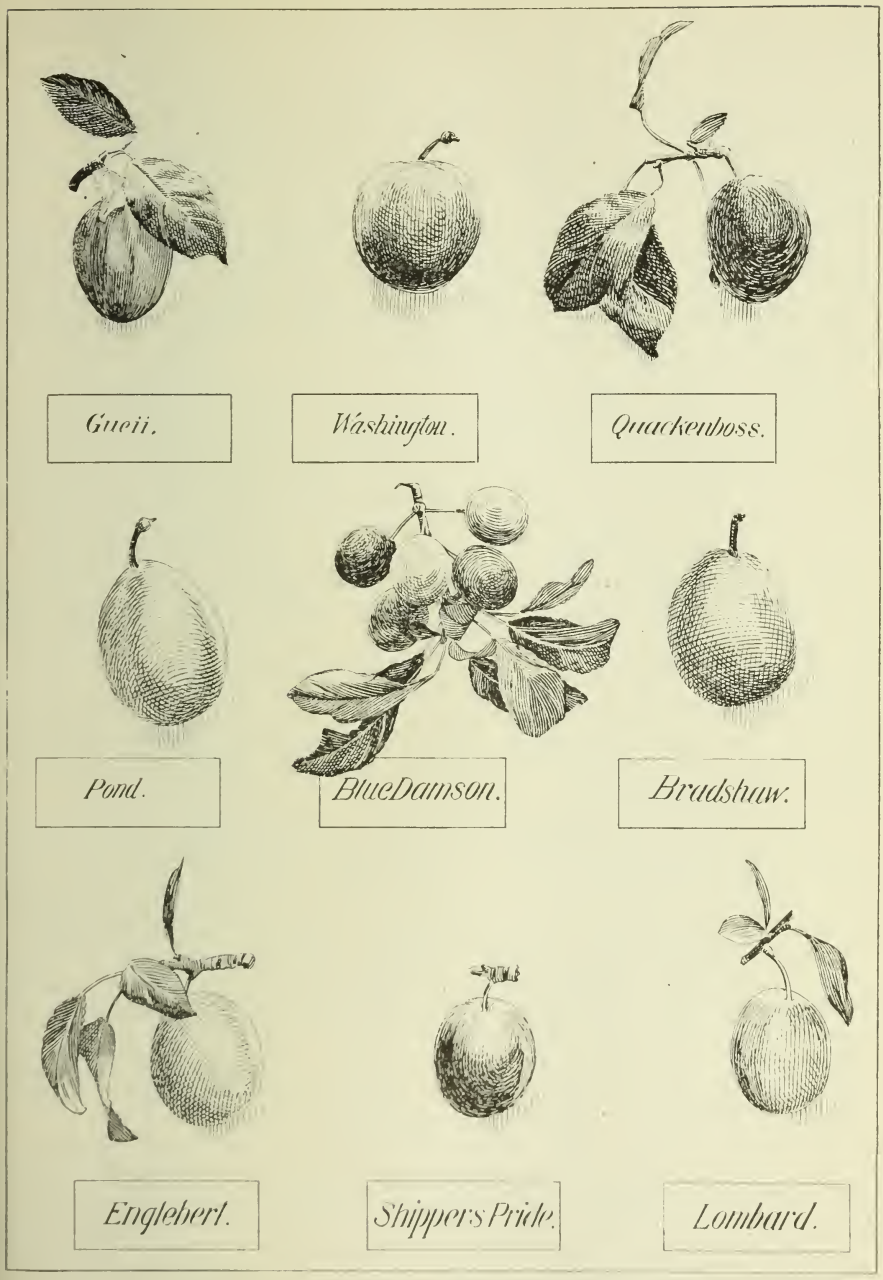

FIG. 6.—VARIETIES OF PLUMS.—(*One-third natural size*).

Jefferson.— Fruit large, oval or slightly obovate with faint suture, golden yellow with reddish blush, and thin white bloom. Stalk stout, one inch

long, but slightly inserted. Flesh, deep yellow, juicy, melting and of high flavor, free from long-pointed stone. One of the best dessert plums. First part of September.

Prince Englebert (Fig. 6).—Tree vigorous; branches smooth, downy. Fruit large, oblong-oval, deep purple with brown dots and blue bloom. Stalk medium with a swelling at the base, set in a deep, narrow cavity. Flesh greenish yellow, juicy, sweet, and of good flavor, free, Early September.

Geuii (Fig. 6).—Tree strong, vigorous, spreading, an early and abundant bearer. Branches stout, smooth, grayish brown. Fruit large, oval, slightly pointed at both ends, suture slight if any; dark purple with thick bloom. Stem long and slender inserted in a deep broad cavity. Flesh light yellow, rather coarse, firm, sweet when fully ripe, free. Middle of September. Excellent for shipping.

Imperial Gage.—Trees upright and fairly vigorous, shoots long and dark, downy. Fruit of medium size, oval with distinct suture. Stalk one inch long, moderately stout, set in a slight depression. Skin pale green becoming yellowish with a distinct marbling of green stripes. Flesh greenish yellow, juicy, rich and melting, generally free from oval-pointed stone. Quite productive. September. Excellent for both table and market.

Pond (Fig. 6) (*English*).—Tree very vigorous; branches grayish and smooth. Fruit large, oval with distinct neck, reddish violet with a thin white bloom, and dotted with brown spots. Flesh yellow, rather coarse, but juicy and sweet. A very showy fruit, quite desirable for market. Middle of September.

Quackenboss (Fig. 6).—Tree, a strong, upright grower, shoots smooth. Fruit of large size, oblong-oval, deep purple in sun, with reddish spots, dark amber in the shade, stalk short, suture indistinct. Flesh yellow, rather coarse, sweet and juicy. Quite productive and a valuable market sort. Middle of September.

German Prune.—Shoots smooth, slender. Fruit large, oval, swollen on one side, tapering particularly toward stem, suture well marked. Skin purple, with dense bloom. Stem slender, three-fourths of an inch long, cavity shallow. Flesh greenish yellow, firm, sweet, free; stone flat, slightly curved. Used for preserving and drying. Middle to last of September.

Damson (Fig. 6).—Tree small, branches slender and thorny, subject to the black knot. Fruit small, oval, depressed, purple with a dense blue bloom, stem slender. Flesh melting and juicy, a partial cling, quite acid. September.

Shropshire Damson.—An English variety. Blue with a thin bloom, oblong or obovate, of rather better quality than the common Damson. Useful for preserves. Last of September, and October.

Coe Golden Drop.—Tree moderately vigorous and quite productive, smooth. Fruit large, oval or obovate, with a slight neck, unequally divided by a well marked suture. Light yellow or greenish yellow with red dots on cheek. Stem seven-eighths of an inch long, quite stiff. Flesh firm, yellowish, adheres to stone, juicy, sweet, excellent. Last of September, and October. Where it ripens it is one of the best late plums.

Fellemburg (*Italian Prune*).—Tree slender. Fruit of medium size, oval, tapering to both ends. Dark purple with a dark bloom; stem in a shallow and narrow cavity, slender, one inch long. Flesh greenish yellow, sweet and juicy, and of good quality, free. First of October.

Bavay (*Reine Claude de Bavay*).—Tree vigorous and productive, smooth;

fruit large, round-oval, depressed, greenish yellow with red dots and pinkish green stripes; flesh juicy, yellow, sugary, of fine quality, nearly free. October. Desirable both for home use and market.

Of the comparatively new sorts that are meeting with favor where they have fruited are *Moore Arctic*, naturally quite hardy, but the foliage drops badly and hence it often winter-kills. Tree vigorous, smooth, grayish-brown, and an early and abundant bearer. Fruit small to medium, round-oval, purplish-black with blue bloom. Stalk medium, slender, in a narrow cavity. Flesh greenish-yellow, rather coarse, juicy, sweet, pleasant, adheres slightly to stone. Seems to have little to recommend it, although it has been largely planted on account of its supposed hardiness and earliness.

Shipper's Pride (Fig. 6).—Tree vigorous, quite hardy and productive. Fruit above medium in size, oblong-oval, deep purple with thick, blue bloom. Middle of September.

French Damson.—Tree more vigorous and a better grower than the other Damsons, hardy and very productive. Fruit of medium size, deep copper color with a rich bloom. . Middle of October. Considered the best of the Damsons by Mr. Willard of New York.

Peters Yellow Gage.—An old but little known plum. Trees fairly vigorous, with short, downy branches. Fruit medium to large, roundish-oval, light yellow, marbled with red in the sun, and with a thin bloom. Stalk large and stout, set in a wide cavity. Flesh yellowish, sweet and juicy. One of the best of the yellow plums. Last of August.

Stanton.—Tree a good grower, fruit medium to large, round-oval; deep purple with a thick bluish bloom. Quite productive. Last of September and early October. An excellent keeper and a promising late sort for canning purposes.

Purple Egg (*Hudson River*).—Tree vigorous and quite productive. Fruit large, purplish-red with thin bloom. Flesh deep yellow, rather coarse. Last of September. A promising market sort.

Of the other new and promising sorts are Czar, Grand Duke, Murdy, Prince of Wales, Black Diamond, and Early Rivers (Rivers Early Prolific).

Simon (*Prunus Simoni*).—Tree small, upright, branches rough. Leaves are small, narrow, and glossy. Blossoms small, very early and hence very likely to be injured by frost. Seems to be a productive sort in this State. Fruit of medium size, round, flattened, with a well marked basin at apex, firm. Color, reddish-purple with brown dots; flesh dull yellow, sweet, rather dry, slightly acrid. Last of August. It seems to have no qualities that make it especially desirable.

AMERICAN PLUMS.

In the common works upon pomology little attention has been paid to any except the varieties of European origin (*Prunus domestica*). There are, however, a large number of varieties in cultivation that are derived from native species. While many of them are largely grown in sections of the South and West where the European varieties do not thrive, they are of but little value in most parts of Michigan. Even when productive, they are generally small in size, with a tough skin and firm flesh, and many of them are of an acrid nature.

Until recently our cultivated native plums have been grouped into two species, the American or Canadian wild plum (*Prunus Americana*,

Marshall) and the Chickasaw plum (*P. Chickasa*, Mich.) A few years since they were carefully studied by Prof. Bailey of Cornell University, and a new classification made as follows:

Group A. The Americana Group (*Prunus Americana*, Marshall).—This species is found from New England to the Rocky mountains and extends from Manitoba to Texas. In the group are placed a number of hardy, strong-growing varieties "characterized by a firm, meaty, usually compressed, dull-colored, late fruit, with thick and usually very tough, glaucous skin, and large more or less flattened stone which is often nearly or quite free, and by large obovate, thick, veiny, jagged, dull leaves." "The fruits are somewhat flattened at the ends, and are commonly marked by a distinct suture. All of the varieties have a light purple bloom." Among the best varieties of this group are Cheney, De Soto, Forest Garden, Hawkeye, Louisa, Maquoketa, Purple and Yellow Yosemite, Rollingstone and Weaver. Wolf and Van Buren are classed as *Prunus Americana* var. *Mollis*, from the fact that they have pubescent shoots and foliage.

B. Wild Goose Group (*Prunus hortulana*, Bailey).—This embraces all varieties with a "wide-spreading growth and mostly smooth twigs, a firm, juicy, bright colored, thin skinned fruit which is never flattened, a clinging, turgid, comparatively small, rough stone, which is sometimes prolonged at the ends, but is never conspicuously winged-margined, and by comparatively thin and firm, shining, smooth, flat, more or less peach-like, ovate-lanceolate or ovate, long pointed leaves which are mostly closely and obtusely glandular serrate, and the stalks of which are usually glandular." This species is found in the Mississippi valley from Illinois southward.

The species seems to be more closely allied to the Chickasaw than to the Americana group. "The fruits are usually covered with a thin bloom and are more or less marked by small spots. In color they range from a vivid crimson to pure golden yellow." On the other hand the varieties of *P. Americana*, seldom, or never, bear fruits of a pure yellow color, being more or less clouded and splashed with red. They are also generally thin skinned and of a dull color. Prof. Bailey recognizes two types in this group, one of which is characterized "by thin and very smooth peach-like leaves, which are very finely and evenly serrate" (Wild Goose), while the other is distinguished by "thicker, duller and more veiny leaves, which are more coarsely and more or less irregularly serrate." (Moreman, Wayland and Golden Beauty.) The latter type seems to connect the plums of the Miner type quite closely with those of the Wild Goose group.

C. Miner Group (*P. hortulana*, var. *Mineri.*)—It differs from the species "by the dull and comparatively thick leaves, which are conspicuously veiny below and irregularly coarsely toothed and more or less obovate in outline, by a late very firm fruit and by a more or less smooth and Americana-like stone." Most of the varieties are quite hardy and are among the best of the native plums for southern Michigan. The best varieties are Clinton, Forest Rose, Miner and Prairie Flower.

D. Chickasaw Group (*P. angustifolia*, Marshall), (*P. Chicasa*, Mich).—The trees of this group have a slender, spreading and irregular growth, the trees are smaller and the leaves are small, lanceolate or oblong lanceolate, closely serrate, shining and generally folded together or trough-like in appearance. The twigs are red and bear, on spurs upon the old wood, dense clusters of small flowers, quite early in the season. The fruit is small, generally red, and more or less spotted; the "flesh is soft, juicy, and

more or less stringy and very tightly adherent to the small, broad, roughish stone." The small-leaved type of the Wild Goose group greatly resemble some of the varieties of the Chickasaw. Even in a cultivated state some of the varieties are quite thorny. Several of the Texas varieties are lacking in hardiness. Among the best of the Chickasaws are Newman, Pottawatamie and Robinson.

E. Marianna Group.—In this class were placed the Marianna and De Caradeuc, both of which have originated from the Myrobalan plums, the former as a hybrid with some native sort and the disseminator of the De Caradeuc whose name it bore believed it also to be of hybrid origin.

The DeCaradeuc is a valuable plum in some localities.

The Marianna was highly recommended as an early market plum when it was sent out, but its principal value is as a stock for other plums. It grows readily from cuttings and it has all of the good features of the Myrobalan and none of its bad ones when used for that purpose.

Many of the American varieties are incapable of fertilizing themselves. It has been particularly noticed with such well known sorts as the Wild Goose and Miner and from their failure to bear fruit the whole class has been condemned. When planted in alternate rows with some good pollenizers they will be found almost sure bearers. However, it must be stated that for nearly all sections of Michigan, the much more desirable European sorts can be grown to such perfection that there is but little occasion for the planting of American varieties.

JAPANESE PLUMS.

Within the last ten years quite a number of varieties have been brought into notice that have come from Japanese species. Most of them have been traced to *Prunus Mume*, either directly or as hybrids between that and some other species. One of the first of this class was the *Kelsey*, which is a large fine plum in the south, but it is not sufficiently hardy for successful planting in Michigan, Under the name of Botan an extremely hardy race of plums has been introduced. It includes both red and yellow varieties and the much lauded *Abundance* plum is sometimes, and properly, called Sweet Botan. It is quite hardy, very productive and although the fruits are not large it is a quite desirable early plum.

The *Burbank* and other seedlings originated and sent out by Luther Burbank of California have been planted in portions of the state where the climate is tempered by Lake Michigan, and they seem hardy there, but it is too soon to judge of their value, although they are very promising varieties.

The *Satsuma* is another variety of Japanese origin. It starts into growth very early and it is probable that it will be tender except in protected locations.

INSECTS AND DISEASES OF THE PEACH AND PLUM.

The intelligent and skillful commercial grower of these fruits, is blessed by a large number of insect friends—*blessed* and *friends* because if not for them so many persons would engage in the business, and the crops would be so large that the price at which they would sell would not pay for their cultivation. Under the present conditions, the number of growers is kept within bounds, and fair prices can be obtained, but even now the man who makes use of the remedies at his disposal in a rational manner will have large and perfect fruit, in years when his less intelligent or less industrious neighbor may have lost his entire crop, or will have inferior specimens that will be a drug in the market, even in a year of scarcity and of high prices. The fact that many of our insecticides and fungicides can be used in combination greatly simplifies and reduces the expense of preparation and application.

Every grower who expects to secure a crop of plums takes some means to destroy the curculio, and the day is not far distant when every successful peach and plum grower, to say nothing of the growers of other kinds of fruit, will make as free use of his spray pump for the application of insecticides and fungicides, as he now does of his curculio sheet. Their use is rapidly increasing and last year the amount of copper sulphate sold in the State of Michigan for use in fungicides was not less than five tons.

In addition to the remedies given, too much stress cannot be placed upon the importance of securing vigorous trees, by use of proper soil and a suitable location, an abundance of mineral fertilizers and, above all, thorough cultivation. Clean cultivation not only aids the trees in their growth, but it breaks up the hiding places of insects. Untidy fence-rows are favorite breeding places for insects, and should not be tolerated. In the following pages will be found formulæ for some of the standard insecticides and fungicides, and descriptions and life histories of some of the more injurious *friends*.

FUNGICIDES.

In Bulletins 59, 83 and 92 formulæ have been given for many of the more useful fungicides, but as they may not be at hand we repeat several that will be found valuable.

Bordeaux Mixture.—Slake two pounds of stone lime, and dissolve two pounds of copper sulphate in a wooden or earthen vessel, pour together and dilute so as to make from twenty to forty gallons as desired. Care should be taken to properly slake the lime, as injury to the foliage may otherwise result. A small amount of hot water may be used, or if cold water is employed it should be added only as fast as the lime will take it up. Air-slaked lime may be used, but the amount should be increased one-half. To make sure that all of the free acid of the copper sulphate has been neutralized by the lime, after they have been poured together, and been thoroughly stirred, add a few drops of ferro-cyanide of potassium, and if it gives a brown color it indicates that more lime is needed, and it should be added until no effect can be produced by the ferro-cyanide. When that condition can be secured it shows that the free acid has been taken up, and that there will be no danger from using the mixture properly diluted upon any foliage. Of the various strengths for this mix-

ture there seems to be little difference in the effect, whether one pound of copper sulphate is used to ten gallons of water or for fifteen gallons, but if much more water is used the efficiency is reduced. For all applications before the leaves appear we prefer to use at the rate of two pounds of copper sulphate to twenty gallons of the mixture, and increase the amount of water by about five gallons for each subsequent application. If the first and second sprayings are made in a thorough manner at the proper times, *i. e.*, before the buds start, and just after the petals have fallen from the blossoms—a third application at from three to four weeks after the second will suffice unless it is desired to control the curculio by means of Paris green, in which case an intermediate spraying with that material alone, about two weeks after the second application of Bordeaux mixture, will be desirable although, as the cost of the material is so small, it will be well to add the copper sulphate, the lime being necessary to prevent the burning of the foliage by the Paris green.

Ammoniacal Carbonate of Copper.—Dissolve three ounces of copper carbonate in 3 pints of ammonia water (26°) and dilute before using with 32 gallons of water. The original solution if kept in a glass stoppered bottle will retain its strength for a long time.

This mixture seems rather less effective than the Bordeaux mixture in the destruction of fungi and is more likely to injure the foliage; in fact it is hardly safe to use it upon the peach, particularly as it is only applied in midsummer, when it is not desirable to use lime upon the ripening fruits. So far as the spotting and poisoning of the fruit with the preparation are concerned there is but little danger, although it is not advised to spray fruits with it that are to be gathered within three weeks.

As sold upon the market copper carbonate costs from 30 to 50 cents per pound, but it can be made for less than half those prices. To make it dissolve one pound of copper sulphate and one pound of carbonate of soda. Pour together and, in the precipitate that forms, there will be the equivalent of eight ounces of copper carbonate. Turn the water off and either allow the precipitate to dry, or use at once as desired. The modified *eau celeste* is practically the same as the ammoniacal carbonate of copper, made as above, except that it contains more copper carbonate and it is rather more effective.

INSECTICIDES.

In order to make an efficient use of insecticides one must not only understand the methods in which they act, but he should have at least some general information regarding the habits of the insects to be treated. Many of the failures reported are due to lack of this knowledge, since a remedy may be used that is unsuited to the purpose, as a little knowledge would have shown. Not only are remedies for sucking insects used upon leaf-eating forms and *vice versa*, but many persons seem to have an idea that spraying will prevent all injuries to their fruit, and without giving thought to the proper remedy expect to destroy insects by the use of fungicides, or the reverse.

Arsenites.—For all leaf-eating insects some form of poison should be used, when it can be placed so that they will obtain it. The more common remedies are Paris green (arsenite of copper) and London purple (arsenite of lime). White arsenic and corrosive sublimate are used by

some persons, but while less expensive are rather more dangerous to have around.

Paris green is rather more efficient than London purple and being less soluble is not so likely to injure the foliage. When purchased in large quantities the cost is little if any more and if to be used in combination with Bordeaux mixture, as is generally desirable, it is preferable to London purple, as the Paris green itself is quite a valuable fungicide. When used alone, however, the water must be kept continually in agitation to prevent it from settling and as there is less danger of this with London purple it has the preference under those conditions.

Neither of these arsenites can be used alone in a proper strength upon the peach, except very early in the spring, without danger of burning the foliage. They can, however be added to Bordeaux mixture at the rate of one pound of arsenite to 250 gallons of the mixture, and the lime will serve to neutralize any free acid. If it becomes necessary to use them independent of the Bordeaux, they can be rendered innocuous if one pound of lime is added for each pound of the arsenite. Combined in this way, it can be used even upon the peach, as strong as one pound of London purple, or Paris green to 200 gallons of water.

Kerosene Emulsion.—This is the best known specific for such insects as obtain their food by sucking it through a tube-like proboscis, although it is fatal to nearly all insects with whose bodies it is brought in contact. It can be readily prepared by heating one quart of soft soap until it becomes liquid, then remove from near the fire and add one pint of kerosene. With a force pump violently agitate the mixture for from three to five minutes until it becomes homogeneous and cream-like throughout. Stirring should not be relied upon, and even when the pump is employed there will be danger from its use if, on standing, the oil collects upon the surface. Every precaution should be taken to secure a perfect and stable emulsion for which rapid work is necessary, which should be kept up until a foamy mass is secured. Before using add six quarts of water so that the kerosene will be about one-sixteenth part of the mass. If soft soap is not at hand from two to four ounces of hard soap may be used instead. Dissolve it in a quart of hot, soft water and after bringing it the boiling point, remove from the fire, add the kerosene and proceed as before. Even more care will be necessary in securing a stable emulsion than when soft soap without water was used.

It should be remembered that, to be effectual, this remedy must be bought in contact with the body of the insects, and as the leaves oftentimes act as a shield, it will need to be applied with considerable force through a fine nozzle in order to produce a mist-like spray.

Carbolic Acid.—The use of this substance about plum and peach trees seems to prevent the curculio and other insects from depositing eggs. The usual way of applying it is as carbolate of lime, or as "carbolized plaster." A half pint of crude carbolic acid is mixed with about fifty pounds, either of air-slaked lime, or with land plaster (gypsum), and thrown over the trees while the dew is on, about the time the blossom have fallen. It should be repeated twice at intervals of ten days, or oftener if washed off by rains.

Carbolic acid can also be used to advantage, combined with kerosene emulsion, for washing the trunks of peach, plum, and other fruit trees, for the destruction of insects; one pint will answer for ten gallons.

Other Remedies.—For the destruction of aphides, scale, and simi-

lar insects, there are several effective remedies, although none of them equal kerosene emulsion. Strong soap-suds will be found a simple and quite effective remedy, and tobacco tea is even more reliable. This can be made by soaking tobacco stems in hot water. For some purposes pyrethrum, or buhack, will be of value. This can be applied as a powder with a bellows, or in water at the rate of a teaspoonful to the gallon.

LEAF-EATING INSECTS.

Under this heading we may include any forms that injure the foliage by biting and chewing the foliage. The plum has something like forty insects that have been known to feed upon it, and there are at least ten that have been found injuring the foliage of the peach. None of them, however, are particularly troublesome, as it is only in rare instances that they become sufficiently numerous to be injurious. When their presence is discovered, it will be a very simple thing to destroy them by the use of Paris green, and as a safeguard we would always recommend the addition of a small quantity, say two oz. to forty gallons, whenever Bordeaux mixture is applied during the growing season, and at the present time the extent of the injury caused by fungous diseases is such that the application of this fungicide should not be neglected.

The cherry slug (*Eriocampa cerasi*) sometimes appears upon the plum, but can be controlled by the arsenites.

SNOWY TREE CRICKET.—(*Oecanthus niveus*, Serv.)

The branches of the plum and peach are often punctured by this insect and eggs are deposited in the punctures. They select the young growth of the trees and make their punctures in long lines one above the other, until from thirty to fifty eggs have been deposited; sometimes a half dozen or more groups of punctures are made upon a single branch. The injured tissues become dry and the branch is much weakened, although if in a vigorous, growing condition the injury soon becomes covered up. Some of the punctured branches can be cut away but in recently set trees it is generally impossible to cut all of them out without removing too many of the shoots.

The eggs hatch in the early Summer and the mature insects are rather beneficial than otherwise, as they feed upon plant lice. In the Fall they deposit eggs and if they are so numerous as to need a remedy, this is the best time. As soon as they are found to be at work, the trees should be sprayed with kerosene emulsion to which one pint of crude carbolic acid has been added for fifteen gallons of the emulsion. It must be confessed that this is not an ideal remedy, as, while the kerosene will kill all the insects it touches, its effects are not lasting, the carbolic acid merely tending to keep the insects from depositing eggs in the trees sprayed, and driving them to other plants. The raspberry, currant and grape are also injured by the snowy cricket.

PLUM CURCULIO.—(*Conotrachelus nenuphar*, Herbst.)

The fruit of the plum, peach and cherry, as well as the apple and pear, are often much injured by the larvæ of this pest, so much so that unless precautions are taken it is almost impossible to secure a crop. The plum

and peach are so injured that they drop from the trees, while the presence of the worms in ripe cherries not only ruins those containing them, but renders the others objects of suspicion.

The perfect insect is a grayish-black beetle about one-sixth of an inch long, with a hump upon each wing cover and a short curved snout, which is turned back beneath the thorax when not in use.

The insects appear about the time the trees blossom (sometimes a few days before), and, as soon as the fruits form, deposit one or more eggs in each. With the snout a small hole is made, upon the side of the fruit, and a cavity is excavated just under the edge of the skin, in which an egg is deposited. To cause the growth of this part of the fruit to stop and thus to prevent the egg from being crushed, the beetle makes a crescent-shaped cut (thus ☾) around the egg. In this mark we have an infallible sign of the work of this insect. Ovipositing continues for about ten days, from five to ten being deposited daily.

The eggs generally hatch in from four to seven days, the larvæ being small, white grubs. They feed upon the flesh and quickly eat in to the stone, around which they feed. They reach full size in from three to five weeks, and the fruits are often so injured that they fall to the ground before this time. When full grown the larvæ emerge from the fruit and enter the ground to the depth of five inches where they change to pupæ and at the end of from four to six weeks become fully developed beetles. In this form they pass the winter hidden under the rough bark, or other similar protection, and come out in the spring ready for work. The mature beetles contrary to former belief, feed upon the foliage and bark, and even eat holes in the young fruits merely for the purpose of obtaining food. From the life history as given above, various preventive remedies are self evident. It will always be well to have all fruit as it falls eaten by hogs or sheep, while poultry are quite useful in a plum orchard. In thinning the fruit those removed can readily be dropped into baskets and then burned. Frequent cultivation at the time the insects are entering the ground will destroy many of them, and fall plowing will also be beneficial. If the trunks of the trees are washed in the early spring with kerosene emulsion we shall both kill many curculio, as well as other insects, and deprive them of a hiding place under the bark as the growth will be less likely to crack. As a rule, however, this will not suffice and other remedies must be resorted to. The most effectual is the shaking or jarring of the trees at the time the insects are depositing their eggs. While the curculio may fly from tree to tree during the day, in the early morning they are not active and if disturbed they generally fall upon their backs and play possum. By jarring the trees at this time they are thrown down and can be caught upon sheets. A screen is made from eight to twelve feet square by tacking cotton cloth upon a light frame-work, with an opening in one side large enough to admit the body of the trees, or two narrow frames may be used, one upon each side of the trees. Another form of screen is often made by tacking strips of wood to two opposite sides of a square of cloth of suitable size, which is open to the center from one end to admit the

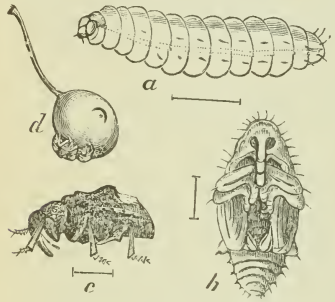

FIG. 7.—PLUM CURCULIO, *a* larva. *b* pupa. *c* adult. *d* plum stung.

tree. Sometimes a screen is mounted upon a wheel-barrow. The trees are jarred by bumping them with a maul padded with rubber to prevent injury to the bark. To admit of giving heavy blows to large trees, some of the branches are cut off leaving stubs to pound against, or pieces of half-inch gas pipe or large nails may be set in the trees for this purpose. The frequency and number of jarrings will depend upon the abundance of the curculio, varying from daily to three or four days apart and continuing for from one to three weeks. The insects should be collected upon the screen and placed in a pan with a little kerosene in the bottom.

While the jarring is the surest way of fighting this insect, the use of arsenites will generally be effectual in saving enough for a crop if they have been kept in check in previous years.

With a good setting of fruit and a comparatively small number of insects, a good crop will be insured by spraying, and where the treatment is kept up from year to year little or no harm is done by the curculio, even when no jarring has been done. While spraying is sure enough to be recommended as above, especially if Bordeaux mixture is also used, we advise all to watch their trees, and if the curculio are present in numbers to jar and thus make sure of them.

The first spraying should be made as soon as the blossoms fall, and will need to be repeated about twice, at intervals of ten days. If rains intervene three or four applications at shorter intervals should be made.

By combining arsenites with Bordeaux mixture we shall also have a remedy for the various fungous diseases of these fruits, and will both render impossible the burning of the foliage and make it more efficacious as an insecticide, as the lime will tend to hold it for a longer time upon the foliage, and will also in part prevent the deposition of the eggs.

The use of carbolized lime also will be found of value, when the arsenites are not employed, or a similar result, *i. e.*, the driving of the insects away from the trees can be secured by the addition of about one pint of crude carbolic acid to twenty gallons of Bordeaux mixture.

THE PLUM GOUGER. (*Coccotorus prunicida.*)

The gouger in some respects resembles the curculio, but it differs in being of a grayish-brown color with frequent white and black spots upon its back; its legs and thorax are of a dull yellow color. In size it is something over one-fourth of an inch long, and its snout is stout, projecting to the front, so that it cannot be doubled back under the body. The eggs are placed in pits that the insect bores in the fruit of the plum nearly as deep as its snout is long. The pits are enlarged at the bottom and the snout is used in pushing the eggs to the lower end. The larva upon hatching eats its way into the seed and feeds upon its kernel. It pupates within the stone, and then emerges as a perfect beetle in September. The gouger is seldom very injurious but the same remedies answer for it as for the curculio, whenever it does appear.

THE ROSE CHAFER—(*Macrodactylus subspinosus*).

The rose chafer, rose beetle or rose bug, as it is variously called, is frequently quite injurious from its eating the flowers, young fruits, and leaves of the peach and plum, as well as the grape, apple and other fruits, and various flowers.

It proves ironclad against the arsenites and kerosene emulsion, and the

only effectual remedy is hand picking in the cool of the day. The use of carbolic acid as recommended for the plum curculio seems to be distasteful to the beetles and tends to drive them away. Clean cultivation undoubtedly tends to destroy them to some extent, as they pupate in the soil.

THE APHIDES OF PEACHES AND PLUMS.

Both fruits are often injured by plant-lice. The foliage of the plum is attacked by the so-called plum-tree aphis (*Aphis prunifolia*, Fitch), while the peach tree aphis (*Myzus persicae*, Sulzer), attacks the leaves and twigs of the peach, and the black peach aphis (*Aphis persicae-niger*, Smith), attacks roots, leaves and tender shoots.

The plum tree aphis, when first hatched, is of a greenish-white color, but it soon grows darker, and later in the season becomes nearly black. Like other plant lice, these insects obtain their food by sucking the juice from the leaves and young shoots. This tends to weaken the plants and the leaves become more or less blistered, and finally roll up. If the attack is severe they may drop from the trees.

The eggs are deposited upon the branches, at the base of the buds or in cracks in the bark, in the Fall. The insects are hatched about the time the buds open in the Spring. The first brood consists entirely of females, which develop in ten or twelve days, after which, for some three weeks, they give birth to about two young aphides daily, and then they die. This is repeated by the successive broods until cold weather approaches, when both males and females are produced. After pairing, the females deposit eggs as noted above.

These insects obtain their food by sucking the juice of plants through their long, slender beaks. It will be seen that they cannot be destroyed by the use of arsenites, and some remedy must be employed that will kill by contact.

For the aphides upon our fruit trees we have no better remedy than kerosene emulsion, although tobacco water, soap suds, and pyrethrum in water are valuable.

The peach-tree aphis works in about the same way as does the plum aphis and the same remedies should be employed. Like the plum aphis, some of the females and also the males are winged, to permit them to seek fresh pastures after one has been fully occupied. The winged females are nearly black in color and about an eighth of an inch in length, while the wingless individuals are of a yellowish red color. The males are yellow with brown markings.

The black peach aphis has been very destructive in the eastern States, where it is found in large numbers upon the branches in the Spring, often killing outright small trees and the younger branches of the older ones; they have destroyed entire orchards in some localities and are particularly troublesome to the young tress in nursery rows. They are dark brown or black in color, and have unusually large beaks.

As noted above, this aphis also feeds upon the roots of the trees and upon sandy soil it is particularly destructive. Dr. E. F. Smith who first discovered its workings attributes to it many so-called cases of yellows. The trees made a weak growth, the leaves were yellow and shrivelled, but none of the distinctive features of yellows were present. The fact that this insect has an underground existence favors its development, as it is out of the reach of ordinary remedies. They are most likely to appear upon trees growing in exhausted soil, hence we should ward off their attack by sup-

plying proper food. If they appear, the use of several pounds of common salt, kainit or muriate of potash to the tree will destroy the subterranean form. All of the above species are destroyed by the common "lady-birds." These, as mature insects, are about three-eighths of an inch in length and nearly as wide. They are beetles and somewhat resemble a small Colorado potato beetle except in color, which in this insect is generally yellow or red, or some intermediate shade, with from one to fifteen, generally round, spots upon the wing covers. The larvæ of this insect and of the lace wing and syrphus flies are also quite destructive. They should be recognized as friends, and not treated as enemies.

THE PLUM-TREE BORER. (*Aegeria pictipes.*)

The trunk and branches of plum trees are often considerably injured by the larvæ of this insect, which gnaw the inner bark and new wood of the trees. The flat-headed apple-tree borer and the peach-tree borer are also sometimes found in the plum tree. An idea of the life history of these insects and the remedies for them can be obtained from the following lines regarding the peach-tree borer.

THE PEACH-TREE BORER.—(*Sannina exitiosa.*)

This is one of the most destructive insects that the peach grower has to contend with, as, unless its attacks are guarded against, the very life of the trees is menaced. The borers are hatched from eggs that are deposited upon the trunk by moths that have a general resemblance to wasps, and at first sight are often mistaken for them. The male has transparent wings with a spread of about seven-eighths of an inch. It has a slender bluish-colored body with yellowish markings. The female has a wing spread of fully one and one-fourth inches, the front pair being opaque and of a glossy, blue color, the same as the body, while the hind pair are transparent with dark margins. The body of the female is cylindrical and considerably larger than that of the male. As a rule, the eggs are deposited close to the ground, but are sometimes placed higher up on the trunk. They soon hatch and the larvæ eat their way through the bark and generally work their way towards the roots. The sap together with the castings extrudes and form a gummy mass at the surface of the ground. The full grown larvæ measure about three-fourths of an inch in length, and are of a yellowish-white color with black jaws and a yellow head. The larvæ remain at rest during the winter, but in the spring after completing their growth they form cocoons at, or just beneath, the surface of the soil and close to the root of the tree. After three or four weeks, the perfect moths appear, generally during July or August, and soon deposit eggs of other broods. The presence of the borers can readily be detected by the gummy exudation and steps should at once be taken to remove them. The tree should be examined in the autumn and again in the Spring, and all borers dug out with a sharp-pointed knife. In order to find them readily, the soil should be drawn away from around the trees, but it must be replaced lest the trees be injured during the winter. Under all conditions, the destruction of the larvae should not be neglected and as a rule it will be sufficient, but, in localities where they are very troublesome it is well to apply some kind of a wash to the trunks of the trees about the first of July, to prevent the deposition of the eggs. One of the best washes is made by thinning down soft soap until it is of the consistency of thick paint and adding a table-

spoonful of crude carbolic acid to each gallon of wash. Paris green and lime are also added by some people. The wrapping of thick paper, or of fine, wire netting, about the tree trunks will also keep the insects from depositing their eggs.

MICE AND RABBITS.

In orchards where the trees are growing in sod, or where there is litter of any kind about the trees, mice sometimes girdle them, and rabbits are frequently quite troublesome. In the first case, a remedy will be found by removing the conditions that favor the mice, which are also of themselves injurious to the trees. If this cannot be done, a mound of soil free from litter placed around the trees to a height of one foot will save them from the mice. Mice, and to some extent rabbits, can be fenced out by wrapping the trees in the fall with paper or netting. Another remedy is to paint the tree trunks in the fall with a lime, or cement wash, to every ten quarts of which a heaping tablespoonful of Paris green has been added. The smearing of the tree trunks with blood is claimed by some to keep away rabbits.

PEACH YELLOWS.

Of all plant diseases none is to be more dreaded than the one that for the want of a better name is known as the "yellows" of the peach. The character of the soil, its location and the variety of the peach seem to have no effect upon its appearance, and whenever it manifests itself the best thing to do is to immediately dig out and burn the trees. Nothing is positively known of the nature of the disease, but as it is undoubtedly contagious it is probably caused by some low form of vegetable parasite allied to the bacteria. The disease has been studied by many persons both chemically and microscopically and for six years the Department of Agriculture has had an expert who has given his entire attention to studying and experimenting with diseased trees; every means has been afforded him, but, although much valuable knowledge has been acquired regarding the disease, nothing has been learned of its real nature. The disease has been at various times ascribed to the effect of soil exhaustion, of borers, of cold, of root aphides, of eel worms (*Anguillulæ*), of wet subsoil, neglect of cultivation or of pruning, the excessive use of nitrogenous manures, or the use of pits or buds from diseased trees. If trees are propagated from either pits or buds of diseased trees the yellows will undoubtedly appear, but experiments by Dr. Erwin F. Smith, the expert mentioned above, and others, seem to show conclusively that the other conditions will not of themselves cause yellows to appear in the peach, although they may induce an appearance that to the inexperienced eye may resemble that disease. It is also very probable that trees weakened by any of the above adverse conditions may be particularly susceptible to it.

HISTORY OF YELLOWS.

Although we have no definite information regarding the time and place of the appearance of yellows, it is quite certain that the disease has been known for at least one hundred years in the neighborhood of Philadelphia, and from that point it gradually spread in all directions appearing in New York in 1801 and in Massachusetts in 1818. Within recent years it

has exterminated the peach orchards of Maryland and Northern Delaware and is gradually spreading southward. It appeared in Berrien Co., Michigan in 1866, the germs being presumably brought in nursery stock from New Jersey. For a few years it spread very slowly but after 1875 it became very destructive and showed itself in nearly every orchard in the county. In 1874 there were fully 650,000 peach trees in Berrien county and in 1877 the shipments were more than a half million baskets, but such was the virulence of the disease that after 1875 few orchards were planted, as young trees were carried off within two or three years. The attack was so severe and so widespread that the number of the trees in the county fell to 50,000 in 1884 and in the townships of Benton and St. Joseph, where it first appeared hardly a tree remained. It worked northward and appeared at South Haven in 1869 and at Paw Paw about 1877. The disease was not particularly destructive at South Haven until 1875, but from that year until 1880 it increased in virulence. The fruit growers of South Haven, profiting by the experience of their neighbors at the south, waged a war of extermination and, where it was followed up, the loss was quite small. In some cases the proper precautions were not taken and entire orchards were destroyed. The history of the disease is about the same in Allegan, Kent and Ottawa counties, where it appeared later. While it has undoubtedly appeared in other counties it has done little harm. It behooves the peach growers in all parts of the state to be on the watch and on its first appearance to stamp it out. With our present lack of knowledge of the real cause of yellows, we can do no more than to subject the trees to such conditions as will be most likely to keep them healthy. We should then, use trees free from taint of disease, plant upon high, well-drained soil, avoid the use of excessive quantities of nitrogenous manures, supplying necessary plant food for the most part in the form of chemical fertilizers; give frequent, regular cultivation; cut back and thin out the trees to secure a strong growth; remove all surplus fruit while still small and thus prevent it from drawing needlessly upon the trees; fight early and late against the borers and other insects, the curl leaf, rot and other fungous diseases. This treatment should give us strong, vigorous trees that will be more likely to escape the attack of the yellows than those grown under opposite conditions would be. While it is believed that favorable conditions for the growth of the trees will render them less susceptible to this and all other diseases, it is not claimed that the trees will have entire immunity and it is not likely that a case of yellows can be cured if it once appears in a tree, but if yellows make their appearance in an orchard where some of the conditions are unfavorable, it is probable that, if the diseased trees are at once removed and the remaining trees are given proper care, they will be less liable to attack than if nothing had been done except to remove the diseased trees. From the fact that we have no definite information, as has been previously stated, regarding the exact nature of the disease, the above cannot positively be stated to be correct, but from our general knowledge of plant physiology, and the fact that plants as well as animals that are in a healthy condition and with congenial surroundings are less subject to disease, than those that are weak and exposed to unfavorable conditions, it will be well for the practical fruit grower at least to hold to this belief until it has positively been demonstrated to be false. The course recommended is the one that will be most likely to give profitable returns and if in any way it aids in warding off the disease it will be so much gained, while if it fails to do this there will be no loss.

TREATMENT FOR YELLOWS.

If the disease makes its appearance, there is but one thing to be done, and everyone now advises that the tree be at once dug out and burned. It will probably be best to dig around the tree and take out the trunk and the larger roots to a distance of perhaps two feet from the stem, although some growers top off the branches and later on cut out the stump. The removal should take place immediately after a tree is found to be diseased, and all growers should familiarize themselves with the appearance of the disease in its first stage, that it may be taken in hand in time.

APPEARANCE OF YELLOWS.

While by some persons the term "yellows" is applied to almost any unhealthy condition of the trees that gives them a yellowish appearance, the true "yellows" as known to peach growers is a specific disease with certain well-defined symptoms by which it can be recognized.

While it may be somewhat modified by local conditions, it almost invariably passes through certain changes and runs a definite fixed course. The yellows first manifest themselves in a tree, in the premature ripening of the fruit. In a healthy tree each variety has a somewhat definite time of maturity, but, if the tree is attacked by this disease, the fruit may color up two or three weeks before those on the neighboring trees of the same variety are ripe. The time of ripening, however, is variable, as sometimes the difference is only a few days but in other cases it may be four or five weeks. Not only do they ripen prematurely, but the fruit upon diseased trees is quite different in appearance from that on healthy ones. Besides being much higher colored than healthy peaches, the surface is more or less blotched with dark red dots, giving the fruit a speckled appearance (Fig. 8, 1). As a rule, the blotches are small and show quite distinctly against a lighter background, but sometimes they are so numerous as to run together and give the face, or perhaps the entire surface of the peach, a purplish appearance. A still more distinctive feature is that the discoloration is not confined to the epidermis, but extends into the center of the fruit so that upon being cut open the flesh has a mottled appearance, the coloring being in the form of streaks, dots and splashes; around the pit the coloring is unusually dark, and sometimes in light colored varieties the entire flesh is of a uniform red color. As a rule, the flesh of premature peaches has but little flavor, although in some cases it is slightly bitter. The fitness for food of premature peaches depends upon the extent to which they are affected, as if the attack is but slight they are palatable, but in the advanced condition they are not fit for food. The safest plan is to destroy all affected fruit. The disease may not appear upon all parts of the trees the first season, but if a single peach ripens prematurely and has a spotted flesh, it is an infallible indication that the tree has the yellows in its incipient stage, and there should be no delay in destroying it and its fruit.

We give here a description of the illustrations on the next page; in Fig. 8, 1 represents a peach attacked by yellows. 2. A healthy peach for comparison. 3. Specimen taken in the Autumn, showing how the tree has put out leaves and blossoms from the Winter buds. The Spring foliage has already fallen. 6. Represents a similar specimen. 4. Shows the tufted Spring growth due to yellows. 5. A branch taken in the Autumn; the Spring foliage has nearly all fallen, and autumn leaves have developed from Winter buds. 7. A healthy peach branch for comparison.

(The illustration was kindly loaned by the publisher of the American Cultivator, Boston, Mass.)

FIG. 8.—PEACH YELLOWS.

SECOND STAGE OF YELLOWS.

Following the appearance of the disease in the fruit, it shows itself by the development of small wiry twigs (Fig. 8, 4), commonly spoken of as a fungous growth. While these frequently do not appear until after the tree has given a crop of premature fruit, a tree showing the twigs will always bear diseased fruit. As a rule, if only a small portion of the fruits are premature, the wiry starved growth will not show until the following season, although they may appear in the autumn on the trees that were healthy the previous year. These shoots grow in clusters (Fig. 8, 4) upon any part of the tree, but generally are most numerous upon the main branches and near the forks. Sometimes they are straight and unbranched, but, as a rule, especially late in the season, they are branched, the buds in the axils of the leaves making a premature growth the same season they are formed. The shoots are often short-jointed and form thick tufts. The leaves are small, being about half as long and wide as healthy ones and have a yellowish tinge. The buds are small and generally winter-kill, as the shoots do not mature their growth.

Another way that it appears, is when apparently healthy trees send out in the autumn the small shoots distinctive of yellows, with the pale yellowish-green foliage. The trees show the same symptoms the second year, as were noticed the first, and in addition the fruit, if any is borne, is small, both in size and quantity, bitter in taste, or at least of inferior flavor. All of the tree is now generally involved, and the foliage is quite yellowish and even red in color and considerably curled, particularly on the shoots sent out in the spring. Sometimes the tree dies the second year, but it is usually the third, or perhaps the fourth year that it finally succumbs. The diseased shoots are quite brittle and seem to have little life. There are no well authenticated cases of recovery from this disease. After a tree affected with the yellows has been removed, it is a common practice to set a young tree in its place, and no harm has been noticed from replanting the spring following the removal of the diseased tree. In case the affected tree was lett long enough to transmit its contagion to the neighboring trees there would undoubtedly be danger of the newly planted tree becoming in time infected by its diseased neighbors, but at any rate the young tree would be less likely to be attacked than other trees in the orchard. In practice, with prompt removal of diseased trees, there seems to be no danger in replanting the next year, and peach orchards of recent years have suffered but little from the yellows, when steps were taken to promptly eradicate the disease as soon as it appeared. This indicates that up to the time of its outward manifestation, the disease is not readily transmitted.

YELLOWS FROM DISEASED PITS AND BUDS.

While there can be no question that the disease can be communicated to the nursery stock by the use of pits or the buds from diseased trees, we believe there is less danger of introducing yellows into a locality in this way than by means of nursery trees grown in the vicinity of diseased orchards, or where the trees themselves were from healthy stocks but were infected by neighboring nursery trees which may have acquired the disease either through the pit or bud. In the experiments of Dr. Smith less than one pit in a thousand from premature peaches grew, but there may

be some danger of the disease manifesting itself in trees grown from pits produced by portions of trees that as yet show no signs of yellows, but that will exhibit signs of yellows the following year. In most cases, however, the nursery trees from such pits will show signs of the yellows the first year and will hardly fail to escape the second, so that on purchasing them the fruit grower will be able to detect the disease before the trees are planted.

It is nearly seventy years since it was claimed that yellows could be spread by the buds, and it is quite certain that if buds are taken from a tree in the second stage of the disease few of them will start at all, and those that do, will make but a feeble, unhealthy growth. When from trees that are just coming down with the disease, *i. e.*, when if in bearing a few of the fruits will be premature,—the disease may not appear to any extent in the nursery and an unscrupulous nurseryman will sell the trees that do not show it, in this way scattering the disease. The only safe way is to purchase trees in localities where the yellows either has not appeared or is in check and where one has good evidence that the pits have come from uninfected regions, and the buds are from healthy trees. If any of these precautions are neglected there is great danger of obtaining the germs of the disease. Many growers claim that if, in carrying a diseased tree from the orchard, a branch rubs against a healthy tree, it will convey the disease, and while this may not be true, it is very probable, and prudence would seem to dictate that the tree be cut up and burned upon the spot, or if carried to a brush pile outside, it should be removed with great care not to bring any part of the tree in contact with a healthy one. As soon as possible the trees should be burned. In localities where the disease prevails, if the affected trees are promptly destroyed the loss seldom exceeds three per cent, while if this is neglected it spreads with increasing virulence until every tree may be destroyed. From the contagious nature of the disease, it can be seen that it cannot be guarded against unless there is concerted action in the infected districts and to secure this the State of Michigan has enacted what is known as the "Yellows Law," which reads as follows:

THE YELLOWS AND BLACK KNOT LAW.

AN ACT to prevent the spread of the contagious diseases known as yellows and black knot among peach, plum, cherry, prune, almond, apricot and nectarine trees, or the fruit thereof, by providing measures for the eradication of the same, and to repeal act number one hundred and fifty-eight of the public acts of eighteen hundred and ninety-one, entitled "An act to prevent the spread of yellows, a contagious disease among peach, almond, apricot, and nectarine trees, and to provide measures for the eradication of the same, and to repeal act thirty-two of the session laws of eighteen hundred and seventy-nine," approved April four, eighteen hundred seventy-nine.

SECTION 1. *The People of the State of Michigan enact*, That it shall be unlawful for any person to keep any peach, almond, apricot, plum, prune, cherry or nectarine tree, infected with the contagious diseases known as yellows or black knot, or to offer for sale or shipment, or to sell, or to ship any of the fruit thereof, except the fruit of the plum and cherry tree; that both tree and fruit so infected shall be subject to destruction as public nuisances as hereinafter provided. No damages shall be awarded in any court in the state for entering upon the premises and destroying such diseased trees, or parts of trees, or fruit, if done in accordance with the provisions of this act.

It shall be the duty of every person as soon as he becomes aware of the existence of such disease in any tree, parts of trees, or fruit owned by him to forthwith destroy, or cause said trees or fruit to be destroyed.

SEC. 2. In any township, city or village in this State in which such contagious diseases exist, or in which there is good reason to believe they exist, or danger may be justly apprehended of their introduction, it shall be the duty of the township or village board, or city council, as soon as such information becomes known to either such board or council or any member thereof, to appoint forthwith three competent freeholders of said township, village, or city as commissioners, who shall hold office during the pleasure of said board, village or city council, and such order of appointment and of revocation shall be entered at large upon the township, village or city records: *Provided*, That the commissioners now appointed and in office shall continue in said office until their successors are appointed and qualified.

SEC. 3. It shall be the duty of said commissioners, within ten days after appointment as aforesaid, to file their acceptances of the same with the clerk of said township, village or city, and said clerk shall be ex officio clerk of said board of commissioners, and he shall keep a correct record of the proceedings of said board in a book to be provided for the purpose, and shall file and preserve all papers pertaining to the duties and actions of said commissioners, or either of them, which shall be a part of the records of said township, village or city.

SEC. 4. It shall be the duty of the commissioners or any one of them upon or without complaint, whenever it comes to their notice that either of the diseases known as yellows, black knot, or other contagious diseases exist, or are supposed to exist within the limits of their township, village, or city, to proceed without delay to examine the tree or fruit supposed to be infected, and if the disease is found to exist, a distinguishing mark shall be placed upon the diseased trees and the owners notified personally, or by a written notice left at his usual place of residence, or if the owner be a non-resident, by leaving the notice with the person in charge of the trees or fruit, or the person in whose possession said trees or fruit may be. The notice shall contain a simple statement of the facts as found to exist, with an order to effectually uproot and destroy, by fire, or as the commissioner shall order, the tree so marked or designated, or such parts thereof within ten days, Sundays excepted, from the date of the service of the notice; and in case of trees known as nursery stock, or fruit so infected, such notice shall require the person in whose possession or control it is found to immediately destroy the same, or cause it to be done, said notice and order to be signed by the full board of commissioners.

SEC. 5. Whenever any person shall refuse or neglect to comply with the order to remove and destroy the trees or parts of trees so designated and marked by the commissioner as aforesaid, it shall become the duty of the commissioner to cause said trees or parts of trees to be removed and destroyed forthwith, employing all necessary aid for that purpose. The expenses for such removal and destruction of trees or parts of trees to be a charge against the township, village or city; and for the purpose of such removal and destruction, the said commissioners, their agents and workmen, shall have the right and power to enter upon any and all premises within their township, village or city.

SEC. 6. If any owner neglects to uproot and destroy or cause to be removed and destroyed as aforesaid, such diseased trees or parts of trees or fruit, after such examination and notification, and within the time hereinbefore specified, such person shall be deemed guilty of a misdemeanor, and punished by a fine not exceeding one hundred dollars, or by imprisonment in the county jail not exceeding three months, or both, in the discretion of the court; and any justice of the peace of the township or city where such trees may be, or where such nursery stock or fruit is sold, shipped, disposed of, or delivered as aforesaid, shall have jurisdiction thereof. The words "parts of trees," wherever used in this act, shall refer to black knot only, and not to trees affected with yellows.

SEC. 7. The commissioners shall be allowed for services under this act two dollars for each full day, and one dollar for each half day, and their other charges and disbursements hereunder, to be audited, as well as any other charges and disbursements under this act, by the township board, village or city council, all of which costs, charges, expenses and disbursements may be recovered by the township, village or city from the owner of said diseased fruit or nursery stock or from the owner of the premises on which said diseased trees stood, in action of assumpsit.

SEC. 8. All of act number one hundred and fifty-eight of the public acts of eighteen hundred and ninety-one be and the same is hereby repealed.

This act is ordered to take immediate effect.

Approved May 25, 1893.

It will be seen that the fruit growers of any section have it in their power to secure the prompt destruction of all fruit and trees in which the disease appears. In Berrien, Van Buren and Allegan counties there are numberless cases where the disease has been kept in check, even after it has appeared in an orchard, and one can also find in those same counties other instances in which the law has not been enforced where the yellows appeared in fully 30 per cent of the trees in 1893, and even then nothing was done beyond cutting off the branches and leaving them on the ground to scatter their contagion, while the trunks of the trees left standing sprouted and sent up wiry shoots that show unmistakably signs of the yellows. If the owners alone are to be the sufferers, after all that has been said and written on the subject, one would hardly waste a thought upon it, but one cannot help feeling sorry for the neighbors whose orchards seem doomed to destruction even though they have not shown public spirit enough (to say nothing of their private interests) to secure the enforcement of the law. As will be noticed, the law also provided for the destruction of the "black knots," upon plum trees, which is a disease fully as fatal as peach yellows, where its appearance is not guarded against. With a little concerted effort, however, this disease also can be readily controlled.

BLACK KNOT. (*Plowrightia morbosa*. Sacc.)

In some parts of the State entire plum orchards have been destroyed by this disease, and there is great danger of its obtaining a strong foothold in the plum-growing districts and crippling that thriving industry. The only hope of safety is in the thorough awakening of every plum grower to the danger that menaces him. If they could see the thousands of acres of plum orchards that have been blotted out by this disease in the State of New York, during the last five years, they might be upon their guard.

In order to successfully combat this disease, all the plum growers in a given locality must be leagued in an intelligent warfare against it. If one man allows the knots to form upon his trees he will spread the disease to his neighbor's orchards. As much of the danger comes from the dispersion of the spores, formed by the knots before they have taken on the black pimply appearance (Fig. 9, 1) that is usually regarded as distinctive, every one should be familiar with the changes through which the knots pass. The spores (seeds) are borne through the air and, falling upon the branch of a plum tree, soon germinate and penetrate the tissues. They grow there until the following Spring without manifesting their presence. A swelling will then be seen at the point infected, generally two or three inches long; the bark cracks and the branch seems to puff out to twice its normal size. If these incipient knots are cut off and burned at this time, the injury to the tree will be stopped and, what is of most importance, it will be destroyed before it has had time to ripen and scatter its spores. In one or two months if left upon the tree, the knot becomes covered with an olive-green mold, made up of an immense number of spores upon their supporting stalks; these are soon scattered by the wind and disseminate the disease. In the Autumn, a hard black crust forms over the knot; this is covered with minute pimples in which a second form of spores is produced. They ripen late in the Winter and are the source of other knots. Hundreds of knots often appear upon a single tree, and as they not only rob the tree of food, but practically strangle and starve the branches upon which they are located by girdling them and thus shutting off the supply of food, the tree is soon destroyed.

One source of contagion is through nursery stock and young orchards should be carefully watched, when trees are obtained from infected districts. Not only is there danger from knots upon other plum trees, but it seems probable that the knots upon the cultivated cherries, choke and other wild cherries and wild American and other wild plums may be of the same species and be able to communicate the disease to plum trees in our orchards. Experiments by inoculation would seem to indicate that the knots upon choke cherries will communicate the disease to cultivated plums, and the only thing that points to the contrary is that the plum orchards in Oceana county are sometimes surrounded by thickets of the wild pin cherry (*Prunus Pennsylvanica* L.), and yet remain free from disease. However, as these thickets of wild plums and cherries are at best a nuisance, prudence would indicate the desirability of applying the ax and fire to them, as there may be conditions under which the disease may be transmitted. It has been noticed that there are unknown conditions under which the disease has greatly increased virulence. For several years it may make but little headway, but at length a time will come when *it will sweep like fire through the plum orchards and entirely blot them out.*

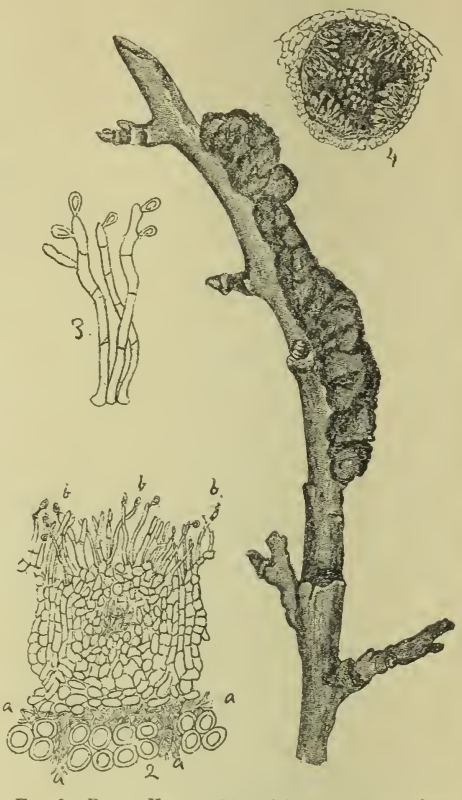

FIG. 9. BLACK KNOT. *Plowrightia morbosa.* Sacc.
1. Stem of plum tree with knot upon it, as it appears in the fall and winter.
2. Perithecium with mycelium, *a a* between the cells of the stem, and covered with filaments bearing spores, *b*, at their extremities. Section made in May.
3. Filaments and spores (*conidia*), more highly magnified.
4. Section through a cavity containing stylospores. After Farlow.

The disease is certainly getting a strong foothold in some sections, and it behooves every plum grower, even if he has but a single tree, to be upon the alert.

It is now nearly five years since the writer began a crusade against the disease, and, from the reports that come in, it is encouraging to see that the growers appreciate the danger that menaces them, and are acquiring the knowledge of its appearance necessary to enable them to combat it upon its manifestation. What is needed now is a united public sentiment against it that will secure prompt action upon the part of all.

While the destruction of the outside sources of contagion should not be neglected, it seems desirous that the trees should be kept in such a condition as will enable them to withstand the disease; hence, thorough cultivation and liberal quantities of mineral manure should be given the orchards. As severe outbreaks of the disease often follow years of full crops of fruit, it

will be a wise precaution to prevent overcropping, and the consequent weakening of the trees, by a judicious thinning of the fruit.

As indicated above, whenever a knot appears it should be cut off, while still but partly developed, *and destroyed by fire.* The cut should be made several inches below the lowest point where any discoloration can be seen in the wood, in order to remove all of the tissues of the fungus and prevent its spread down the branches. If the knot is upon the trunk of the tree, while it might be economy to remove and burn the entire top of the tree, if not the tree itself, it can generally be prevented from spreading if the swelling is carefully pared away and the wound treated with tincture of iodine, which seems to have the power of destroying the tissues of the fungus without injuring the tree. The wound should then be covered with linseed oil paint. Good results have been found from the use of the oil alone but the treatment with iodine seems more efficient.

Cut off or treat the knots whenever they are found, but careful examinations of the trees should be made in the Spring and again in the Fall to prevent the knots that may have escaped attention during the Summer from developing spores.

To secure the proper attention to the destruction of the knots, a law was enacted by the last legislature, as a part of the Yellows law (which is given in this Bulletin under that heading). The intelligent and wide-awake fruit grower does not need to be compelled to destroy his knots, by legislative enactment, but he should avail himself of its aid in securing the destruction of the knots upon the trees of his criminally careless neighbor.

PLUM BLADDERS. (*Exoascus pruni.* Fuckl.)

The fruits of the European plums and both branches and fruit of American sorts are often attacked by a fungus causing them to swell up. The fruits in particular are greatly distended, the contents are destroyed, and only a hollow shell remains, hence the name. The diseased twigs and fruits should be removed and burned. While entire immunity may not be secured by spraying as for the rot and shot-hole fungus, with the Bordeaux mixture, there are no other known remedies.

THE PEACH AND PLUM ROT. (*Monilia fructigena.* Pers.)

Particularly in wet seasons this disease has caused frequent losses to the peach and plum growers, the entire crops in some cases being destroyed. The apricot and cherry also are subject to the same disease. It is most injurious to the early sorts, but few if any varieties are proof against it. In the case of the cherry and plum the foliage as well as the fruit is attacked and the young twigs, particularly of American varieties may also be involved. Not only does the presence of moisture seem necessary for the germination of the spores, but the spread of this disease is in proportion to the humidity of the season. The appearance of the disease is familiar to all, but it may not be generally understood that the patches of yellowish-brown dust seen upon the surface are the spores, or seeds of the disease, by which it is disseminated. When two or more fruits grow so closely together that they touch, the sides in contact are generally covered with moisture, and the germination of the spores is hastened; it is a matter of general observation that if one fruit is attacked the rot always spreads to all fruits that touch it. By the proper thinning of the fruit, the rot is made less destruc-

tive. From the fact that the early varieties of the peach seem most subject to the disease, many growers have given them up entirely. In seasons when damp, muggy weather prevails, it is doubtful if the rot can be entirely kept in check by fungicides, but under fairly favorable conditions, there will be little if any loss from this disease, if Bordeaux mixture is used as directed for the treatment of the peach curl, and of course there will be no additional expense. When we consider the loss that often occurs from even one of these diseases it should induce every fruit grower to make use of this simple and cheap remedy.

In case the month of July is wet and lowery, there will be danger that the early applications of Bordeaux mixture may not be sufficient to hold the rot in check, while in the case of the plum, the shot-hole fungus may need treatment. For late varieties that will not be harvested for six or eight weeks, the Bordeaux mixture may again be used, but for the August sorts it will be better to use the ammoniacal solution of copper carbonate, although this should not be used within three weeks of the time the fruit is to be gathered.

PEACH-LEAF CURL. (*Exoascus deformans.* Berk.)

This disease which is known to be of a fungus nature is in wet, cold seasons very destructive to the foliage of peach trees, often causing all of the older leaves to drop from the tree, and the result is that much of the fruit also falls. The tissues of the affected leaves become thick and later on are blistered and distorted. At first they are of a light olive color but, later on as the spores develop, they are covered with a whitish powder. It was at first thought that as the conditions that favored the appearance of the disease (wet, cold weather) were so unsuited to success in the application of fungicides, that at best they would prove only partially satisfactory, but although the past season was so wet during May and June that in some parts of the State the disease was quite troublesome the results were unexpectedly favorable. At the college, little curl appeared, but along the lake shore many growers were considerably troubled and where tested the fungicides were of value in keeping the disease in subjection.

When in attendance at the summer meeting of the State Horticultural Society at Shelby it was my pleasure in company with others to visit many of the neighboring peach and plum orchards. The curl was quite prevalent but where the trees were sprayed a marked difference was noticed, In the extensive orchard of A. Adams about one-half of the trees received a single application of Bordeaux mixture after the disease appeared, but at the time of our visit (June 15) the effect was very noticeable, as the loss of foliage and fruit was far less upon the sprayed trees. At our South Haven sub-station, as will be seen by the acompanying report of Pres. Lyon, the curl was almost completely held in check, although fully half of the leaves had fallen from unsprayed trees in the neighborhood.

With such a cheap and effective remedy at hand, this disease need not be especially feared. To secure the best results the trees should be thoroughly sprayed with Bordeaux mixture in the spring before the leaves start, the application should be repeated within a week after the petals have fallen and a third application should be made in about three weeks. If very rainy a more frequent use of the fungicide may be necessary, and an

additional application can often be used with profit, as, even if the curl is not particularly troublesome, the treatment will be found effective against the rot of the peach which in wet seasons is so destructive, and by the addition of Paris green the ravages of the curculio will be lessened.

SHOT-HOLE FUNGUS—(*Septoria pruni.*)

The disease to which this very distinctive name has been given has, during the past two years, caused the death of thousands of plum trees in the State of Michigan, and yet, had proper precautions been taken they could have been saved at a cost of not over three cents per tree.

The leaves of plum trees during July and August are often found pierced with a number of holes about the size of a pinhead, the tissue which filled them having been destroyed by the above fungus, and the dead structure then dropped out.

In severe cases, the injury to the foliage is so great that all of the leaves upon the trees, except a few at the tips of the branches, drop off, generally before the middle of August. A tree thus denuded of its leaves is in a poor condition to ripen its growth and prepare for winter, and not only are the watery, unripened branches injured but the entire tree is often killed to the ground. If the ravages of the fungus can be checked, the foliage will be able to perform its functions, and the trees will in most cases survive the winter without injury.

As a rule, if the trees have been treated with Bordeaux mixture, as recommended for the plum rot, there will be but little injury from the disease. It will be well to spray young trees that are not yet in bearing about the middle of July and again early in August, and the spread of the disease can be almost entirely prevented.

PLUM AND PEACH SCAB.—(*Cladosporium carpophilum.*)

This fungus is in some seasons quite injurious to the fruits of both of these fruits, and it also attacks the leaves and tender shoots of the peach.

At the time the fruits begin to color, small greenish spots appear; as these spread the centers take on a brown and even a black appearance. When the spots are numerous they unite and may cover the entire surface of the fruits. The De Soto plum and Russian apricots seem particularly subject to this disease; in 1893 the crop was practically ruined by it. Its workings were not noticed until too late to test the efficacy of fungicides. Prof. Pammel reports the disease upon the increase in Iowa, and it may become generally troublesome.

BROWN SPOT (*Helminthosporium carpophilum.*)

In September, 1893, a basket of seedling peaches in a pedlar's wagon was noticed to be badly spotted with some fungus, that although it had some slight resemblance to *Cladosporium*, was manifestly distinct from it. Superficial examination failed to reveal any specific spores and specimens were sent to Prof. Galloway of the Division of Vegetable Pathology at Washington, for identification. He was not familiar with it, however, and was not able to make out any distinctive spores. Dr. Beal had, however, independently obtained specimens of the disease and after long and careful search found the spores and was able to identify it as the above disease. The fungus seems to be quite superficial in its workings and the fruits

were not noticeably distorted. Many of the fruits were badly spotted and in some cases nearly covered with yellowish brown scabs. From the fact that the disease was not more widely known it evidently has not been very destructive, but if it becomes distributed it may become quite injurious to our peach crop.

GATHERING AND MARKETING.

Even if a good crop is grown, success is not assured until it has been gathered and put upon the market, in fact success or failure will often depend upon the ability with which this is done.

From the fact that both of the fruits under discussion are of a decidedly perishable nature, great care must be taken to gather them at such a period that they will be still in good condition, when placed upon the market.

With the peach, for such markets as are likely to be supplied, the fruit should be gathered just as it is reaching a ripe condition, a period which can better be shown than described. The green color should be just disappearing from the under side of the fruit, giving way to a yellowish-white or flesh color, as the case might be. As an indication to the touch, the flesh of the upper side should give slightly, when pressed with the ball of the thumb. The latter sign is not infallible, but the former seldom ever fails. With a little experience, a man can judge of the condition of a peach without employing either method except occasionally as a test. Under no circumstances should the thumb nail be used to test the fruits, and every precaution should be taken not to bruise them. Taking a fruit lightly and yet firmly, between the thumb and fingers a slight twist of the hand will serve to separate it from its stem. The rule of 'handling as if they are eggs' will not apply with peaches, since they need even greater care.

PACKAGES FOR PEACHES.

The packages best adapted for the shipping of peaches depend, first, upon the wants of the market and, second, upon the grade of fruit and the distance it is to be transported.

For a local market it is generally best to use either peck or fifth bushel baskets for the best quality of fruit, and the bushel or half bushel size for seconds. Much the same rule holds good when shipments are made by rail or boat. It is best, however, to study well the wants of a market and to use the size and style of package that is most in favor with the middlemen and the consumers, as, however it may be in other things, it will not pay to attempt to educate the taste of the public in the style or size of package to be used. With the packing, however, it is different, and an endeavor should be made to put up the fruit in such a way that it can be transported without unnecessary bruising, and at the same time be attractive to the eye. The packing, however, should be honest, and all the peaches should be of the grade indicated by the top layer.

Regarding the use of the fifth bushel and other sizes of packages that were brought out as snides, it should be said that in some markets they are recognized as standard sizes and are sold on their merits. If the middlemen prefer to handle that size, and if the consumers desire it, the producer should by all means supply the demand, as, if the fruit is shipped in pecks, the jobber or retailer will quite likely repack it. The price being by

the basket he will be a gainer to the extent of twenty-five per cent, which really belongs to the producer. On the other hand, where the best trade recognizes the peck basket only, as a legitimate size, it will be very unwise to ship in fifths, as the shipments from parties who use peck baskets will receive first attention, while those in fifths which are here regarded as "snides" are sold for what they will bring.

No arbitrary rule can be given for the grading of peaches, but for an appreciative trade the number of grades should be two, if not three. On the other hand, in some markets and with some dealers as much can be obtained when packed without being assorted, as they can when graded and put up in the most careful manner.

For the average market, after rejecting all decayed and badly injured fruits, two grades are all that it will be desirable to make. The method of grading will depend something upon the market, but, in a general way, the first grade should contain only large, well-colored peaches that are perfect in form and free from blemishes. All other marketable specimens should go into the second grade; the distinctive line between the second grade peaches and those that are to be rejected, will depend upon the market and the abundance of the crop.

If a person can secure a reputation for the grading and perfect packing of his first-class peaches, his brand will secure him an advance of from ten to twenty-five cents per basket above his neighbors, who may have shipped just as good peaches, but for all that the dealer or purchaser may know, unless he inspects every package before buying, he has stuffed with "culls" and the price given will be sufficiently low to insure against loss. The grower who desires to work up a reputation and thus obtain this extra price should carefully brand his packages, showing in addition to his name and address, the grade of peaches contained in the package and a guarantee that the packing is honest. If he does this, and lives up to his representations, he may be sure of an advance over the market price, and in the case of a glut, when his neighbor may not get enough from his shipment to pay charges, he will be sure of a sale at a fairly remunerative price. Many growers do not place their names upon the packages in which the "seconds" are shipped, although the same guarantee of honest packing would have fully as good an effect with them, as with the first-class fruit, in securing its full value and a ready sale when the glut comes. Even if the packages do not have the name of the shipper upon them, they should bear a private mark that would be recognized by the commission merchant, or retailer, and enable him to guarantee the honest packing of the baskets.

The growers in the "peach belt" are as fast as possible releasing themselves from the grasp of the South Water street, Chicago, commission men, and are so far as possible seeking out markets for themselves. The shipments are generally made by express to consumers and retailers in country towns and small cities in non-peach-growing districts, and if well managed a desirable trade can be built up. For shipping in this way the first-class peaches only are used.

The so-called wagon trade is of considerable importance. This consists in the sales made to men who have driven, oftentimes, fifty or seventy-five miles, from points in Indiana or Illinois, perhaps, for the purpose of buying ten to forty bushels of peaches. They peddle them out on their way home, reserving enough for the use of themselves and their neighbors.

One should have some ready communication with his market. The growers in most sections of the "peach belt" can ship either by water to

Chicago or Milwaukee, or by rail to all points. In this way they secure competition in rates, gentler handling of their shipments and more courteous treatment, when favors are requested or complaints made. In localities where one or more cars can be loaded in a day, very low transportation rates and prompt service can be secured, either by fast freight or by express. The thing most needed by the grower is a low express rate to small interior points on small lots.

For the purpose of securing market for the fruits and by coöperation obtaining the highest market prices the so-called "Shippers' Exchanges" or similar organizations have been found very successful in some States, but although they have been formed at various shipping points in Michigan, through no fault of their own, they have not proved as successful as they should. Fairly successful in securing low rates of transportation, they have failed in raising the price obtained for fruit by guaranteeing the packing, through the selfishness of parties who persisted in using snide packages and stuffing them at that.

PICKING AND MARKETING THE PLUM.

The general rules given for the peach, apply also to the harvesting and packing of the plum, but need to be slightly modified in some of their details.

The plum for any except local markets will need to be picked slightly before it is ripe, the amount depending upon the length of time necessary for transportation.

The color, firmness, attachment to the branch, and the taste, are all employed in determining the fitness of a variety for market but with the differences that exist in the long list of commercial sorts, no infallible description will be attempted as a guide for picking. A little practice will soon teach one the proper conditions.

In handling the plum, the same care is needed as for the peach, and particular attention should be paid to the preservation of the bloom. The usual packages for plums are the fifth or peck baskets or the ten pound Climax basket. The style, however, changes from year to year and differs with the market.

AGRICULTURAL COLLEGE,
January 25, 1894.

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A YEAR AMONG FRUITS.

It is now five years since arrangements were made for a fruit testing sub-station at South Haven, in the midst of the great commercial fruit interests of the State, and the fifth annual report of the superintendent, Hon. T. T. Lyon, is appended. The fifteen acres at our disposal are closely planted with the leading tree and vine fruits hardy in this latitude; in making the selection an attempt has been made to secure all of the promising new varieties that are brought out, if possible, in advance of their introduction. As the first planting was done in 1888, with large additions in 1889, 1890 and down to 1893, many of the large fruits are as yet not in bearing, but an idea of the amount of work that has been done can be obtained from the report.

Under the skillful and painstaking care of Pres. Lyon, the plantation has been in splendid condition, and is well worthy of a visit from any one interested in pomology; all such will always find a welcome.

Attention is called to the following points in the bulletin:

First, The elaborate notes upon the varieties under test; as they give the unbiased opinion of one of the most experienced pomologists in the country, they are certainly worthy of careful study. The lists of peaches and grapes contain quite a number of Michigan seedlings that should be watched with interest.

Second, The methods used in combating the insects and diseases. Although the treatment was rather more thorough than would be used by commercial fruitgrowers (or than will be necessary a second year, so well

are they in hand), the results have been so beneficial in the freedom of both foliage and fruit from their attack that all expense has been well repaid. In previous years, the injury from raspberry anthracnose, currant and gooseberry mildew, strawberry leaf-blight, peach curl and rot, plum rot and shot-hole fungus, pear and quince leaf-blight, and from various insects, has been quite severe, but the treatment given has sufficed to keep the trees and plants in almost perfect health.

It has for some years been known that the Bordeaux mixture and other copper compounds were reliable remedies for many fungous diseases, but although our previous experience upon a small scale had led us to believe them of value for strawberry leaf-blight, raspberry anthracnose and peach leaf-curl, the experiments at South Haven the past year have fully convinced us that they should be freely used upon these plants whenever the diseases are troublesome. As is well known, certain varieties of strawberries are much injured by leaf blight, but where they were properly sprayed the plants were practically free from the disease; the same thing was true of peach curl and of raspberry anthracnose.

Elaborate experiments were carried out upon several varieties of grapes, to ascertain the number of applications, and the time of making them, desirable in combating the various diseases to which they are subject. The black rot did not show itself, and there was but slight injury from other fungi. Attention is called to the results upon the Brighton, which was considerably troubled with powdery mildew; as the number of applications increased from none to five, the health of the plants improved in the same degree. Much of the benefit derived from the fungicides was undoubtedly due to the fact that all of the plants were sprayed before the growth started.

L. R. TAFT,
Horticulturist.

To Professor L. R. Taft, Horticulturist:

SIR—In submitting my report of operations for the season of 1893, at the South Haven fruit testing sub-experiment station, it seems convenient to consider the several classes of fruits in the order of their maturing.

The preceding season (1892) proved to be specially favorable for the development of the various species of fungi, the ravages of which proved more than usually injurious. The entire plantation was given a spraying during the late autumn, after the foliage had fallen, and prior to the advent of freezing weather, for the purpose of destroying the winter or

resting spores, and thus, at least to some extent, preventing their development the following season.

The apparent effect of such fall spraying, as well as of those applied during the present season, will be noticed in connection with each class of fruits in its order, as will also the depredations of insects and the remedies applied.

STRAWBERRIES—(*Fragaria*).

The plat of which the following is a record was planted in the spring of 1892. The stand of each variety, when full, consisted of twenty-six plants, of which one-half were kept in hills, by the removal of all runners, while the remaining half were allowed to form a matted row.

Very soon after the planting had been completed, a series of almost continuous rains commenced; the showers followed each other in such rapid succession that the soil remained saturated for a considerable period, while the recently set plants were gaining a hold upon the soil.

The enfeeblement consequent upon this trying condition, occurring at so critical a juncture, proved so serious that, followed as it was by drouth in late summer and early autumn, many, if not most varieties, failed to fully recover their pristine vigor; the result being fewer crowns, in the case of hills, and more limited stands of plants in matted rows, though the latter obviously overcame such check more promptly than did the larger hill plants, a circumstance which may be supposed to account for the fact that the relative productiveness of varieties under hill and matted row culture is very generally reversed, as compared with that of 1891, at which time no serious checks upon the development of the plants occurred during their season of growth.

The present plat was treated to a spray of Bordeaux mixture (4 lbs. copper sulphate, 3 lbs. lime and 32 gallons of water), prior to the advent of freezing weather last fall, and it was repeated on the sixth of April last. Apparently from this cause, the entire plat has been free from attacks of fungi throughout the season—at least till the 29th of July when it was plowed under.

Whether from the same cause or otherwise, the plat was also almost wholly free from the depredations of insects. Only a very few leaf rollers were observed, which were at once destroyed when discovered.

It will be observed that in the naming of varieties we have applied the rules of nomenclature of the American Pomological Society, and the practice of the National Division of Pomology under them; in case of possible doubt, inserting the objectionable word in parenthesis as a synonym.

We omit all tabulated descriptions of varieties, since such must necessarily be too brief and imperfect to be valuable for identification.

STRAWBERRIES—(*Fragaria*).

Numbers.	Names.	b, Bi-sexual; n p, nearly pistillate; p, pistillate.	Origin.	First planted.	First bloom.	First picking.	Last picking.	Vigor—Scale, 1 to 10.	Ounces. Product with hill culture.	Ounces. Product in matted row.	
1	Accomac	b	Del.	1892	May 22	June 21	July 7	3	29	20	
2	Afton	p	N. Y.	1892	" 25	" 21	" 3	5	14	16	
3	Alabama	b	Ala.	1890	" 22	" 21	" 7	5	22	20	
4	Alpha	b	Ont.	1881	" 22	" 21	" 7	6	30	18	
5	American (Great)	b	N. J.	1878	" 20	" 17	" 17	6	54	192	
6	Atlantic	b	N. J.	1890	" 22	" 21	" 14	8	86	197	
7	Auburn	p	N. Y.	1892	" 26	" 21	" 12	9	29	74	Not fully tested.
8	Augwick	p		1892	" 22	" 21	" 14	9	44	181	New.
9	Banquet	p	N. Y.	1892	" 10	" 8	" 14	8	50	160	Needs further trial.
10	Barton (Eclipse)	p	Div. Pom.	1891	" 22	" 23	" 14	8	63	130	
11	Beder Wood	b	Ill.	1890	" 12	" 22	" 14	8	160	485	
12	Beebe	b	N. J.	1892	" 22	" 23	" 5				Planted too late.
13	Belmont	b	Mass.	1885	" 22	" 23	" 10	7	40	79	
14	Bessie	p	Ala.	1890	" 15	" 16	" 3	10	88	79	
15	Belts (3)	b		1892	" 12	" 17	" 14	10	70	32	Needs further trial.
16	Beauty	b	Ind.	1892	" 17	" 21	" 5	6	29	65	
17	Beverly	b	Mass.	1892				3			Try further.
18	Bidwell	b	Mich.	1876	May 22	June 21	July 10	6	45	42	
19	Boynton	p	Ohio	1891	" 22			5			Needs a longer trial.
20	Brunette	b	Ind.	1892	" 19	June 16	July 5	7	24	29	Imperfectly tested.
21	Bubach (5)	p	Ill.	1888	" 22	" 21	" 12	8	73	159	
22	Bubach (24)	b	Ill.	1890	" 19	" 19	" 3	5	21	75	
23	Bubach (132)	b	Ill.	1890	" 17	" 19	" 7	7	35	90	
24	Bubach (137)	b	Ill.	1890	" 12	" 17	" 7	5	85	66	
25	Burt	b	N. Y.	1889	" 19	" 19	" 7	8	64	174	Much like Wilson.
26	California		Del.	1891							Untested.
27	Cameronian	b	Ohio	1892	May 22	June 23	July 12	9	46	91	Needs further trial.
28	Centennial (Ohio)	b	Ohio	1892	" 24	" 23	" 17	5	74	194	Promising.
29	Charleston	b	Ohio	1890	" 22	" 23	" 12	4	13	12	
30	Clark	b	Md.	1892	" 10	" 17	June 30	8	41	38	Try further.
31	Cleveland (Mrs.)	p	Ohio	1888	" 17	" 19	July 10	6	56	83	Not productive enough.
32	Clingto	b	Ohio	1890	" 12	" 23	" 10	4	18	33	
33	Cloud	p	La.	1888	" 28	" 23	" 10	7	62	135	Southern.
34	Covell	b	N. J.	1888	" 10	" 16	June 30	6	63	93	
35	Crawford	b	Ohio	1889	" 12	" 21	July 7	7	32		Plants lacking.
36	Crescent	p	Conn.	1880	" 17	" 21	" 7	7	43	227	
37	Cumberland	b	Penn.	1880	" 24	" 21	" 14	9	56	136	Large; lacks color.
38	Curtis (15)	b	Ill.	1892	" 15	" 21	" 5	5	41	31	
39	Curtis (159)	p	Ill.	1892	" 20	" 21	" 12	8	35	126	
40	Daisy	p	Ohio	1890	" 24	" 21	" 7	6	65	71	
41	Dayton		Ohio	1892	" 22	" 21	June 30	8	10		But imperfectly tested.
42	Dew	b	Mich.	1889	" 29	" 26	July 12	10	30	43	Large; late.
43	Dutter	b	Ind.	1889	" 24	" 26	" 12	6	27	38	Uncertain value.
44	Edgar	p	Ill.	1890	" 20	" 23	" 17	7	101	168	New; promising.
45	Engle (1)	b	Mich.	1890	" 8	" 21	" 17	8	8	120	Of Paw Paw, Michigan.
46	Enhance	b	Ohio	1890	" 12	" 19	" 10	6	88	50	Usually very productive.
47	Estelle	b	Mich.	1891	" 20	" 26	" 17	6	36	87	From Paw Paw, Michigan.
48	Eureka	p	Ohio	1888	" 22	" 26	" 14	7	78	131	
49	Fairmount	b	N. J.	1891	" 20	" 21	" 10	7	76	163	Promising.
50	Farnsworth	b	Ohio	1891	" 22	" 21	" 14	5	27	104	
51	Felton	b	Ohio	1890	" 22	" 26	" 17	7	56	84	
52	Florence	b	Ohio	1888	" 22	" 21	" 14	6	38	38	
53	Gandy	b	N. J.	1887	" 24	" 26	" 14	7	13	112	Popular; late.
54	Gem (Nehring)	p	Ill.	1890	" 17	" 19	" 12	10	48	79	Usually productive.
55	Glendale	b	Ohio	1882	" 22	" 23	" 12	8	43	135	Old; late.
56	Gillespie	b	Ohio	1891	" 12	" 21	" 7	5	38	28	Needs further trial.

STRAWBERRIES—CONTINUED.

Numbers.	Names.	b, bi-sexual; n p, nearly pistillate; p, pistillate.	Origin	First planted.	First bloom.	First picking.	Last picking.	Vigor—Scale, 1 to 10.	Ounces. Product with hill culture.	Ounces. Product in matted row.	
57	Greenville	p	Ohio	1891	May 19	June 23	July 12	7	42	147	Promising.
58	Hampden	p	Mass.	1889	" 20	" 26	" 7	5	52	..	
59	Hatfield	b	N. J.	1890	" 20	" 21	" 7	7	11	57	
60	Hattie (Jones)	p	Ind.	1892	" 20	" 23	" 12	7	121	93	Promises well.
61	Haverland	p	N. J.	1887	" 19	" 21	" 12	7	81	179	Valuable.
62	Henderson	b	N. J.	1888	" 26	" 28	" 7	5	18	17	Superior quality.
63	Hermit	b	Ohio	1892	" 19	" 23	" 12	9	54	120	Promising.
64	Hinman	b	.....	1890	" 22	" 21	" 14	8	64	69	
65	Hoard	b	Wis.	1888	" 19	" 23	" 10	8	51	135	Worthy of trial.
66	Hoffman	b	N. J.	1889	" 22	" 21	" 5	5	9	29	Southern.
67	Holyoke	b	Mass.	1891	" 15	" 21	" 12	6	86	194	Try further.
68	Howard	p	Mass.	1892	" 26	" 21	" 5	6	16	92	
69	Hugo	b	N. J.	1891	" 12	" 16	" 7	7	118	147	Named for Victor Hugo.
70	Huntsman	b	Mo.	1892	" 15	" 17	" 3	8	15	31	New.
71	Hyslop	....	Del.	1892	.....	.....	.....	4	....	....	Not fruited.
72	Iowa (Beauty)	....	Iowa	1892	.....	.....	.....	5	....	....	Not fruited.
73	Ivanhoe	b	Ohio	1889	May 22	June 21	July 7	6	53	101	
74	Jessie	b	Wis.	1889	" 15	" 21	" 10	5	63	89	
75	Jones	b	Ind.	1892	" 19	" 21	" 5	7	20	41	Need longer trial.
76	Jucunda Improved	b	N. J.	1890	" 30	" 23	" 12	7	61	56	Scarcely improved.
77	Katie	b	Ind.	1892	" 22	" 21	" 12	7	30	50	Try further.
78	Kentucky	b	Ken.	1876	" 24	" 26	" 17	10	70	95	Old; late.
79	Leader	b	Ohio	1892	" 12	" 16	" 10	7	39	41	Needs further trial.
80	Lehigh	p	Pa.	1891	" 12	" 16	" 7	7	65	123	Promises well.
81	Leroy	....	Ind.	1892	" 17	" 23	" 12	6	43	78	
82	Leviathan	b	Ohio	1892	" 19	" 16	" 5	8	16	11	Imperfectly tested.
83	Lida	p	N. J.	1886	" 10	" 16	" 10	4	38	41	
84	Lillie (Monroe)	b	Cal.	1891	" 19	" 23	" 7	5	27	43	From California.
85	Lincoln	p	Del.	1892	" 19	" 21	" 7	7	70	216	May be a re-introduction.
86	Logan	b	Ind.	1888	" 22	" 21	" 12	6	48	76	
87	Louise	b	N. Y.	1889	" 31	" 26	" 12	6	51	43	Has desirable qualities.
88	Lovett	b	N. J.	1891	" 24	" 21	" 12	7	57	138	Of medium season.
89	Mammoth	b	N. J.	..	" 24	" 23	" 17	8	53	37	
90	Manchester	p	N. J.	1880	" 17	" 28	" 17	6	137	280	Old; valuable.
91	Mark	b	Ohio	1890	" 22	" 23	" 17	5	37	64	
92	Martha	n p	Minn.	1887	" 17	" 21	" 12	7	139	108	
93	Miami	n p	Ohio	1889	" 22	" 21	" 14	6	67	86	
94	Miller	b	N. J.	1890	" 20	" 23	" 12	7	49	63	
95	Michel	b	Ark.	1890	" 15	" 16	" 5	8	65	105	Of little value here.
96	Miner	b	N. J.	1878	" 22	" 23	" 10	7	65	164	
97	Monarch (Ohio)	b	Ohio	1891	" 20	" 23	" 7	6	25	102	
98	Monmouth	b	N. J.	1888	" 26	" 23	" 14	6	44	79	
99	Moore	b	Mich.	1889	" 27	" 23	" 10	6	35	99	
100	Muskingum	b	Ohio	1892	" 24	" 21	" 12	6	28	92	Needs further trial.
101	Mystic	b	Ind.	1892	" 20	" 26	" 10	6	28	36	Try further.
102	Neptune	p	Ohio	1890	" 26	" 26	" 17	6	47	122	
103	Novelty (White)	b	N. J.	1892	" 22	" 16	June 21	2	8	..	A fancy variety, *F. vesca.*
104	Oliver	b	Ill.	1890	" 22	" 26	July 17	9	65	118	
105	Omega	p	N. J.	1891	" 22	" 21	" 10	9	86	116	
106	Oregon (Everbearing)	p	Ohio	1891	" 15	" 21	" 17	7	66	173	Try further.
107	Osceola (Michel)	b	Mo.	1890	" 9	" 21	June 26	8	19	58	Identical with Michel.
108	Pacific (Great)	p	Ill.	1890	" 22	" 22	July 14	8	109	137	A market variety.
109	Parker Earle	b	Texas	1889	" 24	" 23	" 17	8	82	127	One of the best.
110	Parry	b	N. J.	1886	" 22	" 28	" 14	6	38	89	Large; high quality.
111	Pearl	b	N. J.	1888	" 19	" 23	" 14	8	130	115	
112	Pineapple	b	Ohio	1889	" 22	" 23	" 7	7	32	66	

STRAWBERRIES—CONTINUED.

Numbers.	Names.	b, bi-sexual; n p, nearly pistillate; p, pistillate.	Origin.	First planted.	First bloom.	First picking.	Last picking.	Vigor—Scale, 1 to 10.	Ounces. Product with hill culture.	Ounces. Product in matted row.	
113	Porter	b	N. J.	1890	May 27	June 21	July 10	6	64	75	
114	Price	b	N. Y.	1892	" 20	" 21	" 5	9	48	58	Try further.
115	Princess	p	Minn.	1892	" 27	" 23	" 10	6	85	97	Give further trial.
116	Prince (of Berries)	b	N. J.	1888	" 22	" 17	" 7	4	19	50	Excellent; unprofitable.
117	Puritan	p	Ohio	1887	" 12	" 17	" 7	6	33	19	
118	Putnam (Gen'l)	b	Ct.	1890	" 19	" 21	" 12	10	62	105	Promising.
119	Regina	p	Ala.	1890	" 29	" 26	" 14	9	25	63	
120	Rusk	n p	Ill.	1889	" 12	" 21	" 12	7	89	160	Market variety.
121	Sadie	p	Ohio	1890	" 9	" 16	" 7	8	54	187	
122	Sandoval	b	Ill.	1890	" 12	" 21	" 14	4	51	126	Warfield, No. 1.
123	Saunders	b	Ont.	1889	" 26	" 21	" 10	9	83	178	Valuable.
124	Scarlet Ball	p		1892	" 29	" 26	" 14	9	33	35	Needs longer trial
125	Sharpless	b	Pa.	1878	" 24	" 23	" 12	8	30	80	
126	Shaw	b	Ont.	1890	" 24	" 23	" 14	7	55	86	
127	Shuster	b	N. J.	1891	" 23	" 21	" 10	6	74	157	Valued east.
128	Southard	b	Ct.	1892	" 15	" 19	" 3	5	37	67	
129	Speece	b	Mo.	1890	" 20	" 19	" 10	7	102	122	Promising.
130	Standard	b	Ct.	1892	" 12	" 17	" 3	6	41		Try more fully.
131	Stayman (1)	n p	Kas.	1890	" 26	" 21	" 10	9	104	156	Good.
132	Stayman (2)	n p	Kas.	1890	" 17	" 21	" 10	8	78	88	
133	Stevens	b	Ala.	1890	" 12	" 17	" 3	7	38	86	
134	Sucker (State)	b	Ill.	1890	" 29	" 23	" 12	7	26	49	
135	Surprise	b	Del.	1892	" 30	" 26	June 30	7	17		May be the old Surprise.
136	Swindle	p	Vt.	1892	" 22	" 23	July 12	6	124	124	An unfortunate name.
137	Thompson (1)	b	Ohio	1890	" 22	" 23	" 5	3	12	6	
138	Thompson (4)	b	Ohio	1890	" 12	" 19	" 10	8	50	64	
139	Thompson (5)	b	Ohio	1890	" 15	" 21		7			
140	Thompson (7)	p	Ohio	1890	" 19	" 21	July 12	6	85	185	Promising.
141	Thompson (8)	p	Ohio	1890	" 12	" 21	" 12	8	70	110	
142	Thompson (9)	b	Ohio	1890	" 19	" 21	" 3	7	52	60	
143	Thompson (17)	p	Ohio	1890	" 20	" 26	" 12	6	39	33	
144	Thompson (25)	b	Ohio	1890	" 26	" 23	" 12	7	57	83	
145	Thompson (26)	p	Ohio	1890	" 22	" 23	" 12	8	46	187	Promising.
146	Thompson (31)	p	Ohio	1890	" 20	" 21	" 10	9	96	213	"
147	Thompson (34)	p	Ohio	1890	" 19	" 21	" 10	5	95	78	
148	Thirty-one	b	Ind.	1892	" 22	" 23	" 12	8	34	72	
149	Tippecanoe	b	Ind.	1890	" 17	" 19	" 5	9	35	78	
150	Townsend (2)	b	Ohio	1888	" 24	" 26	" 10	7	15	89	
151	Townsend (3)	p	Ohio	1888	" 24	" 23	" 10	6	47	76	
152	Townsend (19)	p	Ohio	1888	" 19	" 21	" 12	8	118	183	Promises well.
153	Townsend (20)	p	Ohio	1888	" 29	" 23	" 12	6	73	142	
154	Triomphe (de Gand)	b	Belg.	1876	" 27	" 26	" 17	7	41	57	
155	Vernon (Mt.)	b	Kas.	1877	" 19	" 21	" 14		52	122	
156	Vick	b	Mo.	1878	" 22	" 23	" 10	6	97	206	Fruit lacks size.
157	Viola	b	Ohio	1890				7			Not fruited.
158	Waldron	p	Ohio	1891	May 20	June 17	July 7	5	27	43	Try further.
159	Walton	p	N. J.	1890	" 20	" 23	" 14	6	51	130	Promises well
160	Warfield (2)	p	Ill.	1890	" 20	" 21	" 10	9	94	349	Well known.
161	Westbrook	p	N. Y.	1891	" 15	" 17	June 30	7	25	75	
162	Weston	p	Wis.	1891	" 29	" 23	July 12	5	37	62	Or Blue Vine.
163	Williams	b	Ohio	1892	" 29	" 21	" 14	8	56	152	Very promising
164	Wilson	b	N. Y.	1876	" 15	" 21	" 12	8	124	168	Old; well known.
165	Windsor	p	Mich.	1880	" 17	" 17	" 14	6	96	125	Old; well known.
166	Woolverton	b	Ont.	1891	" 17	" 16	" 7	9	38	41	Give it a better trial.
167	Yale	b	Ct.	1890	" 24	" 23	" 14	8	44	49	Valued at the east.

Brief notices are appended of such varieties only as have yielded not less than one hundred and fifty ounces of fruit from a row of thirteen plants, either in hills or in a matted row.

American (Great American), bisexual; originated in New Jersey. It was exhibited, by the originator, at the Centennial Exposition, where it received the highest commendation. It originated under high cultivation and has only proved satisfactory when grown under similar conditions.

Atlantic, bisexual, is a comparatively old variety which, though fairly productive and generally acceptable, has not gained a high standing, so far as profitableness is concerned.

Augwick, pistillate, is but recently introduced. The plant is vigorous and productive, and the berry large, firm, and of medium quality. It has only fruited here this season.

Banquet, pistillate, is new, having only fruited here this season. The plant is vigorous and fairly productive, and the fruit of medium size and quality.

Beder Wood, bisexual, has now fruited here three years, and, both here and elsewhere has won high reputation for vigor and productiveness. In form, color, firmness and quality, it promises well as a market berry. Origin, Illinois.

Centennial (Ohio Centennial), bisexual, is a seedling from southwestern Ohio, and was so named from having first fruited during Ohio's centennial year. It is vigorous and fairly productive, and the fruit quite large, and of much more than average quality. It promises value for market purposes.

Crescent, pistillate, has been too long and favorably known to require a lengthy notice. Too soft for distant marketing, its hardiness, vigor and great productiveness render it desirable for near markets, though it is, to a considerable extent, confined to a low grade of cultivation.

Edgar (Edgar Queen), pistillate, is a fairly vigorous and productive plant; named for Edgar county, Ill., its place of origin. It is comparatively new, and has not yet a well established reputation. The fruit is large, of good form, attractive color; of high quality for so large a fruit.

Fairmount, bisexual, originated in New Jersey; was received for trial from the National Division of Pomology, during the hot, dry summer of 1890. We have been unable to fruit it satisfactorily till this season. The plant is of fully average vigor, and, so far, is fairly productive. Size, above medium; quality, medium.

Haverland, pistillate, introduced several years since, as larger and of higher quality than Crescent, as well as its rival in productiveness, has scarcely verified this latter claim and, either for that reason or for the less satisfactory character of the plant, the variety has not acquired the anticipated popularity with commercial planters.

Holyoke (Mount Holyoke), bisexual, although received as early as 1891, has not been in condition to satisfactorily manifest its qualities till the present season. So far, the plant seems to possess more than average vigor and productiveness. The fruit also ranks high, so far as both size and quality are concerned.

Hugo (Victor Hugo), bisexual, originated in New Jersey, but was received for trial from the Division of Pomology. The plant is very vigorous, and of more than medium productiveness. The fruit is large to very large, and of satisfactory form, color and quality. So far it seems to be well worthy of trial as a market variety.

Lincoln, pistillate, is of more than average vigor, and very productive; fruit large, color attractive, but of scarcely medium quality. In the absence of a history of its origin, its tendency to grow misshapen or cockscombed fruits would seem to warrant the suspicion that it may be merely a re-introduction of the President Lincoln of the previous decade.

Manchester, pistillate, is too well known to require extended notice. Inclined, as it is, to overbear, if in good soil, with high culture and a renewal of the plantation after each full crop, it proves eminently profitable.

Miner, bisexual, though an old and productive variety, under favorable conditions, may now be properly laid aside in favor of newer and more desirable varieties.

Oregon (Oregon Everbearing), pistillate, hails from Ohio. Whatever its habit may be in its original locality, it is not a continuous bearer here, although the plant is vigorous and fairly productive in the usual season of this fruit. In size and quality, it is fully medium. This is its first fruiting here, and improved conditions in the future may develop more favorable results.

Rusk (Lady Rusk), nearly pistillate, was received from Illinois in 1889. In vigor of plant it is above medium. In productiveness it scarcely realizes the commercial requirement of the day. Fruit of more than medium size, firm, of good form and color, and of medium quality.

Sadie, pistillate, is vigorous, and has, this season, proved more than usually productive. The fruit is of less than medium size, and of medium quality and texture.

Saunders, bisexual, is a very vigorous and productive plant; originated by John Little of Ontario and named for one of the most noted horticulturists of the Dominion. In size, quality and firmness, it is quite above medium. It is worthy of extensive trial as a market berry.

Shuster (Shuster's Gem), nearly pistillate, is a popular variety in some parts of the east, though apparently less in favor at the west. Here the plant is above medium in vigor and productiveness, and slightly so also in size of fruit, though of only medium firmness and quality.

Stayman (No. 1), nearly pistillate, is very vigorous and productive; of only medium size and scarcely of medium quality. It is probably more at home in its native Kansas.

Thompson (No. 7), pistillate, comes to us from Ohio. It has not been favorably conditioned heretofore. This season it has proved quite productive; above medium in vigor, quality and firmness, though of only medium size.

Thompson (No. 26), pistillate, from the same source with the foregoing, has more vigor of plant and rather larger fruit, of only medium firmness, and quite low in quality.

Thompson (No. 31), pistillate, is vigorous in plant and large in fruit, but only medium in texture and quality. Its more than usual productiveness and size render it desirable for a near market.

Townsend (No. 19), pistillate, has, this season, shown more than medium vigor and productiveness. The fruit is large, though only medium in texture and quality.

Vick (James Vick), bisexual, is a low growing, very hardy plant, of scarcely more than medium vigor, which, this season, has fairly exceeded itself in productiveness. The fruit, though rich and bright in color, is of less than medium size, though of firm texture and high flavor.

Warfield (No. 2), pistillate, is too well and favorably known to require description. It is generally prized as a market fruit.

Williams, bisexual, is vigorous, and of more than average productiveness. The fruit is large, firm, and of more than medium quality. It may be regarded as a promising variety for both home use and market.

Wilson, bisexual. This old and once universally popular variety is noticed here, mainly as a medium for comparison. When well grown, and free from fungous diseases, it is yet fairly productive, and, when allowed to thoroughly ripen upon the plant, it has even yet few, if any, superiors, all things considered.

RASPBERRIES (*Rubus*).

So many plants, in the trial plat of raspberries, were either killed or seriously injured by the persistent rainy weather of the spring of 1892, that although those remaining have generally recovered quite rapidly, and are now generally in thrifty condition, there are so many vacancies and such unevenness in the size and fruiting condition of the remaining plants that a comparison of actual products would afford but an imperfect and even erroneous idea of the relative productiveness of the varieties when under equivalent conditions. For this reason the productiveness of the several varieties is estimated upon a scale of 1 to 10.

The plat of raspberries was included in the general spraying with Bordeaux mixture of the usual strength (4 pounds copper sulphate, 3 pounds of lime and 32 gallons of water) applied to the plantation late last fall, with the purpose to destroy, as far as possible, the winter spores of fungi.

A spray was again given on the 3d of April last, prior to the commencement of the season's growth, with the same material and strength.

This was repeated on April 24th, with the same mixture, and with the addition of two ounces of Paris green for each 32 gallons of water.

On the 9th of May the plat received a final spray, with a still weaker solution, consisting of 2 pounds of copper sulphate, 1½ pounds of lime, and 2 ounces of Paris green, in 22 gallons of water.

Early last spring all canes, whether new or old, seriously affected with anthracnose were cut away and burned.

Whether as the result of these sprayings and pruning, or otherwise, scarcely a trace of anthracnose has been visible upon the growths of this season, while the foliage has remained perfect throughout the entire period, and neither the attacks of fungi nor the depredations of insects have at any time proved troublesome.

Dry weather and extreme heat during the ripening season occasioned the blasting or withering of more or less of the immature fruit of several varieties.

1. *Rubus Idæus.*

Varieties of European origin.

Number.	Name.	Origin	Planted.	First bloom.	First ripe fruit.	Productiveness. Scale, 1 to 10.	Remarks.
1	Herstine	Penn.	1888	June 12	July 6	6	Excellent; requires protection.
2	Superb	N. J.	1888	" 13	" 19	4	Hardy; fruit large, dark purple.

2. *Rubus neglectus.*

Botanists include, in this species, several varieties, by many assumed to be hybrids between *Occidentalis* and other species.

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Caroline	N. Y.	1888	June 12.	July 10.	10	Yellow; hardy; very productive.
2	Griesa	Kan.	1890	" 12.	" 10.	8	Roots by both tips and suckers.
3	Muskingum	Ohio	1890	" 15.	" 14.	10	Very vigorous; new; valuable.
4	Reliance	N. J.	1888	" 12.	" 12.	8	Very hardy; dark; purple.
5	Shaffer	N. Y.	1888	" 15.	" 14.	9	Tip rooting; large; dark purple.

3. *Rubus occidentalis.*

Black and yellow tip-rooting.

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Ada	Ohio	1888	June 15.	July 17.	6	So far is not valuable.
2	American Everbearing	Ohio	1893				Has not yet fruited.
3	Beebe	N. Y.	1888	June 10.	July 10.	9	Yellow; unsightly if overripe.
4	Canada	Ont.	1891	" 13.	" 12.	6	Of doubtful value.
5	Carman	Conn.	1888	" 10.	" 8.	8	Good; but not relatively profitable.
6	Centennial		1888	" 12.	" 12.	8	Not relatively profitable.
7	Conrath (Early)	Mich.	1891	" 15.	" 15.	9	Highly promising.
8	Cromwell	Conn.	1888	" 10.	" 10.	5	Injured by last year's wet.
9	Doolittle	N. Y.	1888	" 10.	" 8.	5	Generally profitable.
10	Doomore	Ohio	1888	" 12.	" 10.	4	Is unprofitable.
11	Earhart	Ill.	1888	" 10.	" 8.	8	Yields a second crop in autumn.
12	Farnsworth	Ohio	1891		" 12.	3	Promising; needs further trial.
13	Gregg	Ind.	1888	June 14.	" 29.		Badly injured last year.
14	Hathaway (1)	Mich.	1891				Not yet fruited.
15	Hathaway (2)	Mich.	1891				Not yet fruited.
16	Hilborn	Ont.	1888	June 14.	July 21.		Badly injured by last year's wet.
17	Hopkins	Mo.	1888	" 12.	" 10.	5	Suffered from wet last year.
18	Idaho	Ohio?	1889	" 13.	" 17.	4	Badly killed last year.
19	Indiana	Ind.	1888	" 10.	" 8.	4	Badly injured last year.
20	Johnston (Sweet)	N. Y.	1888	" 13.	" 14.		Nearly ruined last year.
21	Kansas	Kan.	1889	" 13.	" 19.	2	Nearly ruined last year.
22	Lovett (Early)	N. J.	1892				Not yet fruited.
23	Mammoth Cluster	N. Y.	1888	June 10.	July 14.	6	Plants considerably injured.
24	Mohler	Ohio	1892				A few fruits on current year's canes.
25	Nemaha	Neb.	1888				Nearly ruined by wet last year.
26	Ohio	N. Y.	1888	June 10.	July 10.	10	Very productive, too seedy.
27	Older	N. J.	1891		" 12.		Fruited but slightly.
28	Palmer	Ohio	1890	June 10.	" 8.	10	The best early blackcap.
29	Progress	N. J.	1890				No fruit this year.
30	Rundell	Mich.	1890	June 10.	July 12.	10	A reproduction of Beebe.
31	Smith (Giant)	Ont.	1889	" 13.	" 17.	10	Very vigorous and productive.
32	Souhegan	N. E.	1888	" 10.	" 7.	6	Usually an excellent early variety.
33	Surrey	Ohio	1889	" 13.	" 20.	1	But imperfectly tested.
34	Sweet Home	Ohio	1890	" 14.	" 15.	2	So far, not promising.
35	Tyler		1888	" 10.	" 8.	7	Practically identical with Souhegan.
36	Virginia	Ohio	1889	" 10.	" 10.	6	Not promising, so far.
37	Winona	Ohio	1891	" 14.	" 17.		Was nearly ruined last season by wet.

4. *Rubus phœnicolasius.*

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, Scale, 1 to 10.	Remarks.
1	Japanese Wineberry	Japan	1891	June 27		1	Worthless except for the beauty of its bloom and foliage.

5. *Rubus strigosus.*

Number.	Name	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness. Scale, 1 to 10.	Remarks.
1	Brandywine	Penn.	1888	June 15	July 10	9	Hardy. A good market variety.
2	Church (Royal Church)	Ohio	1892	" 14	" 17	1	Has not yet shown its true quality.
3	Cuthbert	N. Y.	1888	" 17	" 11	8	Has no superior in its class.
4	Early King	Va.?	1893				Not yet fruited.
5	Eastern King	N. E.	1888	June 12	July 10	7	A good family berry.
6	Gladstone	N. Y.	1892	" 14	" 14	5	Needs further trial.
7	Golden Queen	N. J.	1888	" 15	" 14	8	Excellent for home use.
8	Hansell	N. J.	1888	" 12	" 8	6	One of the earliest.
9	Marlboro	N. Y.	1888	" 12	" 10	4	Next to Cuthbert for market.
10	Reder	Mich.	1888	" 12	" 10	4	Large, bright colored, high quality.
11	Scarlet Gem		1888	" 12	" 10	6	Beautiful; but not relatively profitable.
12	Thompson	Ohio	1888	" 12	" 8	9	A good early variety.
13	Thwack		1892	" 18	" 15	1	Vigorous, productive, poor in quality.
14	Turner	Ill.	1888	" 12	" 10	4	Very hardy; canes without spines.

Notices are appended of the more desirable varieties, also of other more recent ones not yet fully tested.

BLACK OR YELLOW CAPS.—TIP-ROOTING.

Beebe—A yellow variety, very productive; of fair quality if used promptly, but if allowed to become overripe, the color becomes dark and forbidding, with loss of flavor.

Rundell (the name of the originator), a more recent seedling from southwestern Michigan, is merely a reproduction of the Beebe, with the same general characteristics.

Cromwell has now been several years before the public, and seems to be winning a good reputation as an early blackcap, ripening nearly with Tyler, and surely quite as early as Doolittle.

Doolittle was the forerunner, introducing the blackcaps to cultivation. It even yet maintains a creditable standing among the various rivals which have since arisen to contest with it for popular favor.

Earhart produces a light crop at the usual blackberry season, and also a second crop in autumn, upon the canes of the current season's growth. It may be desirable in the home plat, as a means of supplying this fruit out of the usual season.

Farnsworth, a recent variety from Ohio, has only fruited here this sea-

son. It gives indications of value, as a fruit of medium season, for both the home and market.

Gregg is too well known as a profitable, strictly market variety to require special notice. Aside from its dense pubescence and rather low quality, its chief fault is lack of hardiness.

Hilborn has not, so far, acquired a wide reputation as either a family or market variety, although, to the writer's apprehension, it deserves a position nearly or quite at the head of the list, so far as quality is concerned.

Nemaha is a reproduction of the Gregg, with improved hardiness, as alleged by those who claim to have thoroughly tested it.

Ohio is popular as a hardy, vigorous and very productive variety. It is specially commended for its large, proportionate yield of the dried product; but it is doubtless true that the increased yield consists not of dried pulp, but of seeds instead.

Palmer, origin Ohio, proves to be early for a blackcap, and one of the finest and most vigorous and productive of its season.

Smith (Smith's Giant), so far, has proved to be exceedingly vigorous and very productive. It hails from Ontario, which may be taken as assurance of its hardiness.

Souhegan and Tyler, although doubtless of separate origin, are, for all practical purposes, identical. They are valued especially for earliness, although somewhat lacking in both size and productiveness, as compared with several later varieties.

Sweet Home is an old variety which seems not to have taken a hold upon popular favor, or to have developed specially valuable qualities. A limited experience with it here gives little promise of better results.

RED, YELLOW AND PURPLE VARIETIES.

Increasing by root-suckers; a few of which are also tip-rooting.

Brandywine, though by no means new, is still valued as one of the best red raspberries for marketing. Even when so overripe as to drop from the plant, it may yet be marketed in fair condition.

Caroline is an alleged hybrid between *R. Idæus* and *R. occidentalis*. It is very hardy, and roots from either suckers or tips, though somewhat reluctantly from either. The fruit is of scarcely medium size, pale yellow, of delicate texture, and produced very abundantly. The quality is only medium. Origin, New York.

Cuthbert still holds an unquestioned position, as one of the most desirable of the red varieties, whether for the home plat or for market. The plant is very vigorous, and resists mildew of the foliage unusually well.

Golden (Golden Queen) is clear bright yellow in color. Otherwise it is very much like Cuthbert, in both plant and fruit. For the home plat it is excellent.

Griesa (the name of the introducer, temporarily applied) is a red variety. The habit of the plant is intermediate between *R. strigosus* and *R. occidentalis*. Like Caroline, it roots, rather reluctantly, from both suckers and tips. The fruit possesses the general characteristics of *R. strigosus*. It requires further trial to determine the question of productiveness. It hails from Kansas.

Hansell is early, and the plant hardy. It is valued for planting, to a limited extent, for both home use and market, on account of its earliness.

Marlboro, though rather low in quality, is large and bright colored. It is popular as a rather early market variety.

Muskingum is of comparatively recent introduction, coming, as we understand, from Ohio. The plant is exceedingly vigorous and very productive, with characteristics referable mainly to the species *strigosus*, while the fruit has the large size, dark color and general appearance of Shaffer. It equals Shaffer in productiveness and, like it, is excellent for canning.

Reder (although the plant may not be satisfactory for commercial uses) has few if any superiors in size; rich, bright color, fine texture and flavor, for the table. It is fairly productive. A native of Berrien county, Michigan.

Reliance, like its parent, the old and now abandoned Philadelphia, is very hardy and productive. The fruit is high flavored, but dark colored, and rather small. It is well adapted to localities in which great hardiness is requisite.

Shaffer is too widely known to require extended notice. The vigor and productiveness of the plant, with the high, rich flavor and large size of the fruit, especially adapt it for canning, for which purpose it has long been popular.

Thompson has, this season, proved highly productive. Should it continue thus, it may prove desirable as an early market variety.

Thwack, though only planted last year, was well tested here several years since. It is hardy, vigorous, of good size, and productive, although very low in quality. Although old, it has never become popular for either amateur or market purposes.

Turner is small and very mild in flavor. The plant is vigorous, and the canes destitute of spines. It is the hardiest of the red raspberries and (doubtless for that reason) is somewhat popular at the west and north.

Herstine, like all varieties of its species (*Idaeus*), tested in this country, lacks hardiness, requiring winter protection, even in the comparatively mild winter climate of southwestern Michigan. On account of its large size, bright color, and superior flavor, it is deemed worthy of the needful winter protection. Origin, Pennsylvania, from seed of a foreign variety.

BLACKBERRIES (*Rubus villosus*).

The entire loss of many plants, and the serious injury of others, resulting from the almost continuous drenching rains, during the late spring and early summer of 1892, were but partially remedied by the subsequent growth of that year, leaving the stand of plants decimated or uneven to such extent that comparisons of actual fruitage during this season will afford no just indication of the comparative productiveness of the varieties under ordinary conditions. Under such circumstances, therefore, resort is had to estimates, based upon the actual performance of such plants as appear to be most nearly in a normal condition, results being indicated upon a scale of one to ten.

Anthracnose having been very prevalent during the year 1892, attacking nearly or quite all the varieties of blackberries as well as of raspberries, the plat was included in the spraying which the plantation received, after the dropping of the foliage in late autumn, 1892. Early last spring

examination was made, and all canes showing indications of anthracnose were cut out and burned.

On April 1 to 3 last, the plants received a spray of Bordeaux.

Again on April 24 and 25, they were sprayed with reduced Bordeaux, using 32 gallons of water and adding two ounces of Paris green.

A final spray was given on May 8 and 9, using two pounds of copper sulphate, with one and one-half pounds of lime in 22 gallons of water, and adding two ounces of Paris green.

As the apparent result of these several sprayings, with the removal of the previously diseased canes, scarcely a trace of fungus has at any time during the season appeared upon blackberries, while, in all cases, satisfactory growths have been made.

The leaf miner is apparently not amenable to spraying, having proved increasingly troublesome this season, confining its attacks almost wholly to the blackberry.

BLACKBERRIES—(*Rubus villosus*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness. Scale, 1 to 10.	Remarks.
1	Agawam	N. E.	1888	June 12	July 27	4	Usually large and fine.
2	Bonanza	.....	1888	" 14	" 27	4	Name a misnomer.
3	Briton (Ancient Briton)	Eng.	1888	" 12	" 28	3	Usually over-productive.
4	Childs (Tree)	.....	1892	.....	.....	.....	Not yet tested.
5	Cluster (Early Cluster)	N. J.	1888	June 13	July 25	10	Of little value.
6	Eldorado	Ohio	1892	.....	.....	.....	Not yet tested.
7	Erie	Pa.	1888	June 12	Aug. 2	5	Generally productive.
8	Fruitland	Ohio	1892	.....	.....	.....	Good grower. Not fruited.
9	Harvest (Early Harvest)	N. J.	1888	June 13	July 17	5	Small. Very early.
10	Hoosac	Mass.	1891	.....	.....	.....	Old. Thornless.
11	King (Early King)	N. J.	1890	June 14	July 21	10	Very desirable so far.
12	Kittatinny	N. J.	1888	" 14	" 29	6	One of the best; rather tender.
13	Knox	.....	1888	" 15	" 27	5	Large. Bears thinly.
14	Lawton	N. Y.	1888	" 13	" 27	4	Old. Often winter-killed.
15	Lincoln	.....	1891	" 12	.....	.....	New. Not yet fruited here.
16	Mammoth (Early Mammoth)	Ohio	1891	" 14	July 31	4	Needs farther trial.
17	Minnewaska	N. Y.	1888	" 15	Aug. 2	4	Is generally more productive
18	Nevada	.....	1888	" 15	July 27	3	Not valuable here.
19	Ohmer	Ohio	1892	.....	" 29	2	But partially tested.
20	Oregon (Everbearing)	Oregon	1892	.....	.....	.....	Not yet fruited here.
21	Snyder	.....	1888	June 10	July 25	10	Rather small. Very hardy.
22	Stone	Wis.	1890	" 10	Aug. 5	3	Small. Very hardy.
23	Taylor	.....	1888	" 12	July 29	6	Hardy. Excellent.
24	Thompson (Early)	Ohio	1890	" 13	" 28	9	New. Promising.
25	Triumph (Western Triumph)	.....	1888	" 14	Aug. 1	2	Small. Hardy. Vigorous.
26	Wachusett	Mass.	1890	" 10	July 27	5	Old. Thornless.
27	Wallace	.....	1888	" 13	" 29	5	Large. Very good.
28	Wilson	N. J.	1888	" 13	" 28	6	Canes tender. Large. Early.
29	Wilson, Jr.	N. J.	1888	" 13	" 25	6	Is Wilson reproduced.

Notices are appended of some of the older varieties, with their performance during the current year, together with a few of the more recent introductions.

Agawam has been fruited here for several years. It has rarely, if ever, suffered injury from the lake shore winters. It is productive, and the fruit is large and excellent. It is eminently worthy of a place in the home plat.

Briton (Ancient Briton) has been a long time in cultivation in this country, and is popular at the west, where the larger varieties fail from lack of hardiness. It has been assumed to be a native, but recent investigation determines that it was originally imported from England. Its comparatively small size renders it unpopular where larger though less hardy varieties can be profitably grown.

Erie is very vigorous, with many large, strong, prehensile spines, and is hardy in this climate, though it suffered seriously from the long wet spell of last year. The fruit is very large, and of fair quality, if allowed to fully ripen upon the plant. The habit is spreading, and the canes should be tied to a trellis or stakes, to prevent injury from high winds.

Harvest (Early Harvest) is a moderately vigorous, very upright grower and very productive. The fruit is rather small, of firm texture, ripening quite in advance of the usual blackberry season, and, for that reason, profitable. A spurious variety, of similar habit, has been disseminated under this name.

King (Early King), received from New Jersey, has fruited here this season only. The plant is vigorous and productive, and the fruit quite large and of good quality, ripening rather early.

Kittatinny has long been recognized as the best of the large varieties, though deficient in hardiness. For some years it has been more or less subject to attacks of the fungus known as red rust, which has, in many cases, proved a serious drawback upon the value of the variety, though it may be held in check, and even exterminated, by promptly digging and burning the diseased plants when discovered.

Lawton, though not the first blackberry subjected to cultivation, was the first one extensively disseminated for such purpose. It lacks hardiness and, as usually marketed, is objectionably acid, though, when thoroughly ripened upon the plant, it is large, sweet and delicious.

Mammoth (Early Mammoth), was received from a nursery formerly in Ohio (now in Virginia), and has only fruited here this season. It promises well. Fruit large, of good quality, and the plant is vigorous.

Minnewaski was received some years since from its originator, the late A. J. Caywood, of New York. The plant is a strong, rather erect grower; productive, and of fully medium hardiness. The fruit is large and of good quality.

Oregon (Everbearing) comes to us as an estray from the Pacific coast, as its name indicates. It has not yet fruited here, though it seems desirable, if only as a curiosity. The plant has the trailing habit of a dewberry with the usual reflexed spines of the blackberry. The foliage has the usual five leaflet arrangement of the blackberry, with each leaflet somewhat irregularly divided, lobed and serrated, somewhat after the manner of the cutleaved birch or maple.

Snyder is well known as a hardy and productive market variety; extensively planted in localities in which special hardiness is requisite.

Stone (Stone's Hardy) hails from Wisconsin. It is a spreading, vigorous grower and very hardy. Fruit too small to be acceptable where larger varieties are successful.

Taylor is nearly as hardy as Snyder, with more branching, light colored shoots. It is very productive, ripening its rather large, superior flavored fruit, somewhat after the average season.

Thompson (Early) comes to us from Ohio. It proves hardy here, and

has this year excelled most other varieties in productiveness. The fruit is of fair size and good quality. (Probably Mammoth, L. R. T.)

Triumph (Western Triumph) is one of the varieties approved at the west on account of hardiness. The plant is tall, rather upright, branching; although the fruit is of less than medium size, the deficiency is more than compensated in productiveness. It must have good soil and culture to produce marketable fruit.

Wallace came to us from the west. The plant is vigorous and moderately productive. Fruit of large size and good quality. It is worthy of more attention than it has heretofore received.

Wilson, and Wilson, Jr., (the latter a seedling of the former) are for all practical purposes identical. Both have, to a slight extent, the spreading habit of the dewberry and, like it, will sometimes root, though reluctantly, from the tips. Both are deficient in hardiness. Fruit large to very small, and not of high quality.

SERVICE BERRY.—(*Amelanchier.*)

An indigenous form of this plant, forming a large bush or small tree, occasionally from twelve to fifteen feet in height, is more or less disseminated in Michigan forests. It varies greatly in productiveness, as well as in size and quality of fruit. As far as known, no attempts have been made to subject this to cultivation.

The dwarf variety, which was planted here as early as 1876, under the name Service Berry, only tends, if left undisturbed, to form dense clumps, by means of underground branches or stolons, under which conditions it becomes comparatively unproductive. When such tendency is prevented by occasional transplanting, or otherwise, the result is a very considerable improvement in size, as well as in quantity of fruit.

Birds have a special liking for the fruit, which ripens in succession, and invariably falls a prey to their rapacity, before full maturity.

The bushes rarely exceed three feet in height, and the fruit, which resembles the huckleberry, is by no means its equal in quality.

Three varieties are on trial here.

The first, lacking a varietal name, is designated as *common.* On a scale of one to ten, it ranks, this year, about eight in productiveness.

The second, received from Indiana as Mammoth, is slightly larger in plant, and in productiveness ranks nine.

The third is named "Success" by the recent chief of the Division of Pomology at Washington. In productiveness it will rank ten.

A few plants received a covering of netting, to protect the fruit from the birds. This was applied on July 7, when the fruit began to color. The fruit was gathered about July 18, fully ripe, and beautiful in appearance, though, from lack of rich flavor, it can scarcely supersede the better varieties of huckleberries, where such are obtainable.

CURRANTS.—(*Ribes.*)

The plantation of currants suffered more or less from the long continued drenching rains of the spring of 1892; although the most serious injury arose from the cutting away of a large portion of the bearing wood, in the effort to eradicate the twig borer (*Aegeria tipuliformis*, Linn.) which has long been extremely prevalent in this region.

The currants were included in the spraying given the entire plantation, after the fall of the leaves in the autumn of 1892.

A spray with Bordeaux mixture was given them on April 1–3, 1893. They received a second spray on April 18, using 4 lbs. copper sulphate, 3 lbs. lime and 2 oz. Paris green, in 32 gals. water.

Rain having intervened, a reapplication of the same was given on April 24 to 25.

On May 8–9 another spray was given, using 3 lbs. copper sulphate, 1½ lbs. lime, and 2 oz. Paris green, in 32 gals. water.

The currant worm having put in an appearance, a spray of 2 oz. potassium sulphide (liver of sulphur), and one oz. Paris green, in ten gals. water, was applied on June 2.

This was repeated on June 21, using 3 oz. potassium sulphide instead of two. Rain having intervened, the same was reapplied June 24.

This preparation was again applied on July 6, omitting the Paris green; and yet again for the last time, on July 22.

These sprayings have, apparently, had the effect, not only to hold the currant worm in subjection, but also to prevent the attacks of the fungus, which has so generally ruined the foliage early in August, since, under this treatment (which was also applied to the gooseberry), there has been no loss of the foliage of either, down to the time of this writing (Oct. 1), while the plants generally have made satisfactory growth.

It may also be stated, as a possible result of these repeated sprayings, that few indications are visible of the attacks of the twig borer; the inference being, either that the liver of sulphur is repulsive to the moth or, otherwise that the Paris green may have proved fatal to the larvæ when making their first meal upon the recently sprayed twigs.

1. MISSOURI OR YELLOW FLOWERING CURRANT—(*Ribes aureum*).

Number.	Name.	Origin.	Planted	First bloom.	First ripe fruit.	Productiveness. Scale 1 to 10.	Remarks.
1	Crandall	Kan.	1889	May 12	July 8	5	Of doubtful value.

2. BLACK, FETID CURRANTS—(*Ribes nigrum*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness. Scale 1 to 10.	Remarks.
1	Champion (Black Champion)	Europe	1889	May 12	July 11	7	Try further.
2	English (Black English)	"	1892	" 13	" 14	2	Needs further trial.
3	Lee	"	1888	" 12	" 8	4	One of the best blacks.
4	Naples (Black Naples)	"	1888	" 15	" 10	4	Old; well known.
5	Saunders	Ont.	1890	" 15	" 10	4	Yet too recent.
6	Wales (Prince of Wales)	"	1890	" 12	" 14	3	Yet too recent.

3. RED AND WHITE CURRANTS—*Ribes rubrum*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness, scale 1 to 10.	Remarks.
1	Cherry	Eur.	1888	May 12	July 14	0	One of the largest. Acid.
2	Fay	N. Y.	1888	" 10	" 11	1	Large. Plant unsatisfactory.
3	Holland (Long bunch'd Holland)	Eur.	1889	" 10	" 11	6	Strong, healthy. Late.
4	Lakewood	Ohio	1890	" 10	" 14	1	Need a fuller trial.
5	London (Red)	Eur.	1890	" 12	" 8	10	Best for culinary uses.
6	Moore Ruby	Am.	1890	" 10	" 8	6	Best red variety.
7	Moore Select	Mass.	1890	" 10		0	Requires further trial.
8	North Star	Minn.	1892	" 14	July 14	1	Very vigorous. Hardy.
9	Red Dutch	Eur.	1888	" 10	" 8	5	Most valuable red currant.
10	Raby Castle	"	1892			1	May prove to be Victoria, but said to be distinct.
11	Versaillaise	"	1888	May 12	July 10	0	Much like Cherry.
12	Victoria	"	1888	" 10	" 10	7	Seldom attacked by borers
13	White Dutch	"	1888	" 10	" 10	7	Finest flavored currant.
14	White Gondoin	"	1890	" 10	" 8	8	Needs further trial.
15	White Grape	"	1888	" 10	" 8	7	Most profitable white variety.
16	Wilder	Am.	1890	" 10	" 10	1	Promising.

Owing to the operations of the twig borers during the year 1892, and the amount of bearing wood unavoidably destroyed during the past spring, in the effort to exterminate them, the product of the season now past has been greatly diminished. For this reason the estimates of productiveness given in the foregoing tabulation indicate but imperfectly what would be the relative yield of the varieties named under more favorable conditions. For this reason short notices of some of the varieties are given, for the purpose of, at least in part, remedying such defect.

Crandall (when the heaviest fruiting plants *only* are considered) proves highly productive. The quality of the fruit, when well cooked, is good, but for the extreme thickness and toughness of the skin, even when thoroughly cooked—a difficulty which, apparently, could only be obviated by straining the cooked product.

Naples (Black Naples) and Lee are the only fetid black currants sufficiently tested here. How the remaining varieties upon the list will rank as to quality, size, productiveness, etc., can only be surely determined after a somewhat lengthened trial. From present indications, they differ but slightly in these respects.

White Dutch, White Gondoin and White Grape rank in about the order named, so far as rich, mild flavor and consequent adaptation as dessert varieties is concerned. In these particulars they are quite superior to any of the red varieties, with the possible exception of the Moore Ruby, which is yet but imperfectly tested.

Cherry, or its close rival Versaillaise, must be allowed to stand in advance of Fay so far as profitableness and adaptation for market are concerned. All are acid and large and, for that reason, popular in the market.

Red Dutch, although one of the oldest varieties, yet stands first among the red currants, so far as quality as well as productiveness is concerned. But for a slight lack of size, it would doubtless lead also in the market.

Victoria is scarcely as large, and a little later than Red Dutch. On

account of its comparative exemption from the attacks of the twig borer, and the greater persistence of its foliage, it is popular for market planting in many localities.

Holland (Long Bunched Holland) is doubtless the most vigorous of red currants, and holds its very large foliage more persistently than any other of our acquaintance. It is productive and late, the cluster long, but the berry small.

London (London Red) is exceedingly productive; the berry medium; said to be superior for jams and jellies.

Lakewood, Moore Select and Wilder, though some time on trial, cannot yet be definitely characterized.

North Star was planted only last year. It shows unusual vigor, but its other qualities remain undetermined.

Raby Castle, planted in 1892, may prove to be Victoria, although Mr. J. H. Haynes of Delphi, Ind., from whom the plants were obtained, claims that it is a new variety, quite distinct from the old Raby Castle.

GOOSEBERRY (*Ribes*).

The plantation of gooseberries, being adjacent to that of currants, the two have been subjected to the same treatment, so far as spraying is concerned, for an account of which the reader is referred to the section on currants.

The result of such repeated spraying has been an entire absence of mildew, whether of foliage or fruit, save in the single case of the Smith, which, apparently from previous enfeeblement, has failed to fruit this year, and has also prematurely lost more or less of its foliage.

The use of a few ounces of Paris green in the potassium sulphide spray has kept the currant worm in subjection.

The crumpling of the young leaves at the tips of the branches (mainly of the Houghton), attributable, doubtless, to minute aphides, has been but slightly troublesome this year, it having been cut away and burned upon its appearance.

Nearly all varieties, whether of native or foreign parentage, have fruited very thinly, a result probably due to the enfeeblement consequent upon the excessive and long continued wet weather of early 1892, together with the mildew consequent thereupon, preventing, as it doubtless did, the development of the fruit buds necesssry for the next season's crop.

1. WILD GOOSEBERRY—(*Ribes cynosbati*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness. Scale, 1 to 10.	Remarks.
1	Downing	N. Y.	1888	May 9	July 14	3	Valued for market.
2	Mountain	N. Y.	1888	" 17	" 17	0	Not desirable.
3	Smith	N. E.	1888	" 10		0	Poor grower. Fruit superior.
4	Strubler*	Ill.	1892				Strong grower.
5	Tree*	Ohio	1892				Strong grower.

* Nos. 4 and 5 have not yet fruited. Their correct classification is doubtful.

1. EUROPEAN GOOSEBERRY—(*Ribes grossularia*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness. Scale, 1 to 10.	Remarks.
1	Auburn	N. Y.	1890	May 24	July 15	1	The correct name unknown.
2	Golden (Golden Prolific)	N. Y.	1890	" 15		0	Quite liable to mildew.
3	Industry	Eur.	1889	" 12	July 14	1	Mildews, unless sprayed.
4	Orange (Early Orange)	N. Y.	1890	" 12	" 15	0	Mildews, unless sprayed.
5	Pearl	Ont.	1890	" 9	" 17	8	Very promising.
6	Oregon (now named Apex)	Oregon	1892				Not yet fruited.
7	Triumph	N. J.	1891	May 10	July 19	0	Objectionable name.

3. SMOOTH GOOSEBERRY—(*Ribes hirtellum*).

Number.	Name.	Origin.	Planted.	First bloom.	First ripe fruit.	Productiveness. Scale, 1 to 10.	Remarks.
1	Champion	Ohio	1888	May 10	July 15	0	Strong; healthy; unproductive.
2	Houghton	N. E.	1888	" 12	" 17	5	Hardy; very productive.
3	Pale Red	Am.	1890	" 10	" 17	6	Nearly identical with Houghton.

Downing is a strong grower, with stout, very thorny shoots. Fruit large, round, green when mature. Popular in the market.

Smith is not a vigorous plant; very thorny. Fruit large, greenish-yellow, oval; of superior quality.

Mountain is a strong grower and free from mildew. Fruit large, but variable in size; poor in quality. Worthless.

Auburn is of European type, a moderate grower; has not mildewed here. Fruit large, light red when mature. The true name is unknown.

Golden (Golden Prolific), Orange (Early Orange) and Pearl are American seedlings of the European type. Industry is an importation from England. They are all more or less liable to mildew here, requiring occasional spraying to maintain their health in this climate.

Triumph, received from New Jersey, and Oregon (now named Apex) from the Pacific coast, received but recently, are understood to be American seedlings, the former of the European and the latter of the Pacific coast type.

Champion, although vigorous and apparently mildew proof, is so unproductive and the fruit so small and poor as to render it practically worthless.

Houghton and Pale Red are much alike. Both are hardy, productive and mostly free from mildew. They will bear neglect better than most varieties. Fruit small.

CHERRIES (*Prunus*).

Probably few, if any, species of fruit trees are as impatient of excessive moisture in the soil as are the cherries. In their case the injury from the copious and long continued rains of the spring and early summer of last year has proved more serious than was apparent during that season, since quite a number of trees have this season shown indications of injury obviously attributable to that cause.

A large number of varieties have bloomed and fruited this season, but most of them so sparsely that, on account of the depredations of birds in many cases it has been difficult to accurately determine the date of ripening.

The cherry plantations were included in the spraying given the entire plantation in November, 1892.

April 10 and 11 cherries were sprayed with diluted Bordeaux, using 4 pounds copper sulphate, 3 pounds lime and 2½ ounces Paris green, in 32 gallons of water.

On June 8 they received the second spray this season, using 4 pounds copper sulphate, 3 pounds lime and 2½ ounces of Paris green, in 32 gallons of water.

On June 27 they were treated with kerosene emulsion to extirpate the slug (*Eriocampa cerasi*).

On July 7 the pest having reappeared the trees were treated with the extract of tobacco stems, after which further treatment for this insect was not found necessary.

On July 14 and 15 cherries received a final treatment, consisting of 2 pounds copper sulphate, 1½ pounds lime and 2½ ounces Paris green, in 32 gallons water.

The slug (*Eriocampa cerasi*) has been much less troublesome this year than formerly, yielding readily to the sprays given as stated.

No other insects have proved troublesome upon the cherry, the curculio apparently confining operations to adjacent rows of plums and peaches.

No attacks of fungi have been noticed, except as the cause of premature loss of foliage by a few of the injured trees already mentioned.

Experience has shown that the Mazzard or sweet cherries (and to a slight extent the Dukes also) when grown rapidly, as under thorough cultivation they usually do in our Michigan soil and climate, are often seriously if not even fatally injured during subsequent severe winters, and when branched as high as is generally done they are liable to what is known as "bark-burst" during severe cold in winter, followed by death after a very few years of decrepitude and disease.

No remedy has yet been discovered for such conditions. Prevention is, so far as known, the sole alternative. This may be accomplished by giving only so much manure and cultivation while the tree is still young as shall produce only moderate, healthy growth and partially or wholly omitting cultivation thereafter; also branching them so low that the trunk and larger branches, in which, if at all, bursting is likely to occur, shall be well shaded from the influence of the mid-day sun, by the foliage.

Under such conditions trees of these species may be reasonably expected to reach mature age in sound condition, while under opposite conditions

they would be in danger of perishing even when scarcely yet in full bearing.

In the following tabulation the arrangement of last year placing Heart and Bigarreau cherries together in one class and Dukes and Morellos in another is continued.

1. HEART AND BIGARREAU CHERRIES—(*Prunus avium*).

Number.	Name.	Class.	Origin.	Planted.	First bloom.	First ripe fruit.	Remarks.
1	Bigarreau (Yellow Spanish)	Big.	Eur.	1890	May 20	July 10	Type of the Bigarreau class.
2	Cleveland	Big.	Ohio	1890	" 18		Originated by the late Dr. Kirtland.
3	Downer	Heart	Mass.	1888	" 15	July 4	Profitable for market.
4	Eagle (Black Eagle)	Heart	Eng.	1888	" 18	" 7	Old. Excellent.
5	Elton	Big.	Eur.	1890	" 18		Yellow, with a red cheek.
6	Florence	Big.	Italy	1891			Has not yet fruited.
7	Knight (Knight's Early)	Heart	Eng.	1890	May 19		An excellent early cherry.
8	La Maurie (Early Lamaurie)	Heart	Eur.	1892			Not yet tested.
9	Mary (Kirtland's Mary)	Big.	Ohio	1890	May 19		A seedling of Dr. Kirtland.
10	Mezel	Big.	Eur.	1890	" 20		Large. Popular in Europe.
11	Napoleon	Big.	Eur.	1892	" 19		Very firm. Fine market cherry.
12	Ohio (Ohio Beauty)	Heart	Ohio	1890	" 19		A fine variety from Ohio.
13	Purity			1891			Yet untested.
14	Purple (Early Purple)	Heart	Eur.?	1891	May 22		The earliest of the older cherries.
15	Rockport	Big.	Ohio	1890	" 18		Popular.
16	Tartarian (Blk. Tartarian)	Heart	Eur.	1888	" 17		Large. Tree upright, vigorous.
17	Transparent (Coe's Transparent)	Heart	Conn.	1888	" 17		One of the most beautiful.
18	Windsor	Big.	Ont.	1890	" 18		New, late, promising.
19	Wood (Gov. Wood)	Heart	Ohio	1890	" 18		A popular market variety.

2. DUKES AND MORELLOS—(*Prunus cerasus*).

Number.	Name.	Class.	Origin.	Planted.	First bloom.	First ripe fruit.	Remarks.
1	Abbess (Oignies)	Morello.	Europe.	1888	May 18	July 12	A slender grower. Late.
2	Angouleme	Duke?	"	1888	" 21		Vigorous. Promising.
3	Baender	Morello.	"	1892	" 20		Not yet fruited.
4	Bessarabian	"	"	1888	" 17	July 8	Imported by Prof. Budd, of Iowa.
5	Brusseler (Braune)	"	"	1888	" 20		Imported by Prof. Budd, of Iowa.
6	Carnation	Duke	"	1890	" 18		Needs further trial.
7	Choisy	"	"	1888	" 20	July 5	Beautiful. Excellent. Amateur.
8	Du Nord (Griotte du Nord)	Morello.	"	1888	" 22		Imported by Prof. Budd, of Iowa.
9	Dyehouse	"	Am.	1890	" 19		Very early. Slender. drooping.
10	Eugenie	Duke	France.	1888	" 6	July 6	Comparatively new. Promising.
11	Everbearing	Morello.	Am.	1892	" 22		Yet untested.
12	Frauendorfor (Weichsel)	"	Europe.	1888	" 18	July 8	Late, very acid.
13	Galopin	"		1892			Not bloomed or fruited.
14	Glass (George Glasskirche)	Duke?	Europe.	1888	May 22	July 1	As importation by Prof. Budd.
15	Hortense	"	France.	1888	" 16	" 6	One of the largest of the Dukes.
16	King (Amarelle)	Morello.	Europe.	1892			Only tested as to growth.
17	Late Duke	Duke		1890	May 20		Old, but little known.
18	Lithauer (Weichsel)	Morello.	Europe.	1892			Has not shown bloom or fruit.
19	Louis (Phillippe)	"	"	1888	May 15	July 5	Late. Good. Lacks productiveness.
20	Lutovka	"	"	1888	" 17		Promising.
21	Magnifique	Duke	"	1888	" 20	July 31	A fine late variety.
22	Mahaleb	Mahaleb	"	1892			Used only as a stock.
23	May Duke	Duke	"	1888	May 18	July 6	The type of the class.
24	Minnesota(Ostheim)	Morello.	Am.	1892	" 19	" 10	Requires further trial.
25	Montmorency	"	Europe.	1888	" 20	" 5	Probably Mont. Ordinaire.
26	Montmorency (Large)	"	"	1890	" 19		Fruit destroyed by birds.
27	Montmorency (Ordinaire)	"	"	1890	" 22		Fruit destroyed by birds.
28	Montreuil	Duke	"	1890	" 20		Very promising.
29	Olivet	"		1892	" 20		But partially tested.
30	Ostheim	Morello.	Europe.	1888	" 18		Requires longer trial.
31	Ostheimer	"	"	1892	" 24		Not yet fruited.
32	Richmond (Ey. Richmond)	"	"	1888	" 22	July 1	Most popular for market.
33	Royal Duke	Duke	"	1890	" 20		Old, but little known.
34	Sklanka	Morello.	"	1888	" 20	July 4	Imported by Prof. Budd.
35	Spate (Amarelle)	"	"	1888	" 22		Imported by Prof. Budd.
36	Strauss (Weichsel)	"	"	1888	" 18		Imported by Prof. Budd.
37	Suda	"		1892	" 22		Not yet well tested.
38	Twenty-five (Orel)	"	Europe.	1892	" 22		Not yet well tested.
39	Twenty-seven (Orel)	"	"	1892			Not yet well tested.
40	Weir 2	"	Ill.	1892	May 22		Not yet well tested.
41	Wragg	"	Iowa	1891	" 27		A slender grower. Late. Acid.

SWEET CHERRIES.

Purple (Early Purple), nearly black when fully ripe, is the earliest well tested cherry, of fair size and good quality, with the possible exception of La Maurie (Early Lamaurie), which has not yet fruited here.

Knight (Knight's Early), Eagle (Black Eagle), superior in quality, and Tartarian (Black Tartarian), valued for market, are among the most popular dark colored cherries.

Of light colored varieties, Transparent (Coe) is excellent and very beautiful, while Cleveland, Elton, Wood (Gov. Wood), Napoleon and Rockport are firm, good handlers and, for that reason, adapted to marketing.

Bigarreau (Yellow Spanish) is the best of the light colored, firm fleshed varieties, but, unfortunately, it is liable to crack and decay before ripening, during warm, wet weather.

Downer, though less firm, is hardy, rather late, very productive, large, of rich color, profitable.

Windsor is newly introduced; said to ripen quite late. It is highly commended by those who have fruited it.

THE DUKES.

Intermediate between the sweet cherries and the Morellos, so far as vigor of growth and acidity of fruit are concerned.

Choisy (Belle de Choisy) is exceedingly beautiful and of mild flavor, and, in the opinion of many, unexcelled in any class. Unfortunately it lacks productiveness.

Eugenie, Hortense (one of the largest Dukes), Magnifique (very late), May Duke (the type of the class), Olivet and Montreuil (comparatively new varieties), are all worthy of greater attention than they generally receive.

Royal Duke and Late Duke are old varieties though, so far as known, not yet thoroughly tested in this State.

MORELLOS.

There appear to be several more or less distinct races which, among Europeans, appear to have been sub-classified accordingly. In this country, so far, such sub-classification has not received attention.

Dyehouse is a very spreading and even drooping grower and, so far, has been the first to ripen.

Richmond (Early Richmond) is so well known as a popular market variety that extended notice seems unnecessary. In season, it closely follows the foregoing.

Louis (Phillippe) is large, late and excellent for culinary purposes, but is slightly lacking in productiveness.

Wragg is valued at the west for its hardiness. It is late, nearly black, and quite acid. The tree is a slender, spreading grower.

Montmorency (see table) is probably identical with Montmorency Ordinaire.

Of the remaining varieties of Morello, a considerable number have now fruited; several of them, apparently, are quite late. Further trial is needful to determine their comparative values.

MULBERRIES (*Morus*).

This, in one or more species, occurs, though rarely, in the forests of this State, occasionally as a tree of considerable size.

The varieties grown at this station, however, are imported, being of such as have become improved, and taken on the habit of maturing their fruits in succession, through a considerable period.

Downing is an American seedling of this character from Multicaulis

(*M. alba*). In severe winters it is occasionally injured, even in southern Michigan.

New American and Hicks also have this habit, with apparently superior hardiness.

Russian (*M. Siberica* of nursery catalogues) is abundantly hardy here, though of no value so far as fruit is concerned.

Teas Weeping, when grafted high on upright growing stocks, makes a beautiful lawn tree. The foliage is glossy and beautiful, much superior to that of Kilmarnock willow; long popular as a weeping lawn tree.

PEACHES (*Prunus Persica*, *Amygdalus Persica*, or *Persica Vulgaris* of various botanists).

The trees of this species upon the station grounds received a spray of Bordeaux of the usual strength after the leaves had fallen last autumn.

April 10 and 11, 1893, they were again sprayed, using 4 lbs. of copper sulphate, 3 lbs of lime and 2½ oz. of Paris green in 32 gallons of water.

June 8–12, the spray was repeated, using the same mixture.

June 29 they were again sprayed, using modified Eau Celeste. (Two lbs. of copper sulphate, 1½ lbs. of carbonate of soda and 1 qt. of ammonia water in 32 gallons of water.)

July 14 to 15 a final spray was given, using 2 lbs. copper sulphate, 1½ lbs. lime and 2½ oz. Paris green in 32 gallons water.

This last spray caused considerable loss of the older foliage, leaving that near the extremities of the young shoots in all cases apparently unaffected.

As the apparent result of the first two sprayings mentioned there has been an almost total absence of "leaf curl" (*Taphrina deformans*) which is usually quite prevalent here in early spring and which was present this year in neighboring orchards, causing many of the leaves and fruits to drop.

Apparently also the fungus which usually, in this climate, attacks the foliage and growing twigs of the serrate varieties of the peach has been subdued by these applications, since a single serrate variety growing here which has been annually very severely attacked by this fungus has this season almost wholly escaped, making sound healthy growth as in the case of other varieties.

The only insects which have proved troublesome are the curculio, for whose attacks jarring has been the remedy employed, and the borer (*Sannina exitiosa*) to remove which the trees were "wormed" in September –a process intended to be repeated in April or May next.

For more convenient reference all abbreviations are inserted at the head of the columns in which they are used.

In very many cases the *origin* of a variety is unknown or uncertain, for which reason in most cases the source from which the variety was received is inserted instead of the place of origin.

The word "cling" is appended to the names of varieties of that class, and in a few cases only the word "free" is appended to the name to avoid uncertainty. In all other cases the word "free" is to be understood, the column usually devoted to this particular being omitted as unnecessary.

In many cases names are simplified or objectionable portions enclosed in parentheses to indicate probable future elisions in compliance with the rules of modern nomenclature.

PEACHES.

Number.	Name.	Origin.	Planted.	Flowers. l, large; s, small.	Glands. s, serrate; g, globose; r, reniform.	First bloom.	First ripe fruit.	Color. w, white; y, yellow; r, red.	Flesh. p, pale; y, yellow.	Flavor. s, sweet; v, vinous; a, acid.	Remarks.
1	Adrian	Mo.	1892		g						
2	Alexander	Ill.	1892		g			w r	p	v	A partial cling.
3	Allen	Mo.	1891	s	r	May 22					
4	Alpha	Mo.	1891		r						
5	Amelia	Mo.	1890	l	r	" 22					Of Carolina.
6	Amsden	Mich.	1891	l	g	" 22		w r	p	v	A partial cling.
7	Andrews (Mammoth)	Mo.	1892		r						
8	Barber	Mich.	1892		r						
9	Barnard	Mich.	1888	s	r	" 22	Sept. 11	y r	y	s	For market only.
10	Beers (Smock)	Mo.	1890	s	r	" 22					
11	Belle	Mich.	1891		g						
12	Bell (Favorite)	Del.	1890	s	r	" 24					Distinct from Belle.
13	Bequette Cling	Tex.	1890	s	r	" 22					
14	Bequette Free	Tex.	1890	s	r	" 22					
15	Bickell (Late)	Del.	1890	s	r	" 22	Oct. 30	w r	p	a	May not ripen here.
16	Bishop (Early)	Mo.	1891	s	g	" 22					
17	Bonanza	Mo.	1891	s	r	" 22					
18	Boyles	Mo.	1891	s	g	" 22	Sept. 20				Only a specimen or two.
19	Brandywine	N. J.	1890	s	g	" 22					
20	Brett (Mrs. Brett)	Mo.	1890	s	r	" 22					
21	Brigdon	N. Y.	1890	l	g	" 22	Sept. 20	y r	y	v	Valued for market.
22	Briggs (Gov. Briggs)	Tex.	1890	s	g	" 24					
23	Bronson	Mich.	1891	s	r	" 22					
24	Brown (Early)	Mich.	1892	l	r	" 22					
25	Burke	Mich.	1892		r						
26	Canada (Early Canada)	Mich.	1892	l	g	" 22					
27	Carolina (Beauty)	Mich.	1892								
28	Chair (Choice)	Ohio	1890	s	r	" 22					
29	Champion (Mich.)	Mich.	1890	l	s	" 26					
30	Champion (Ohio)	Ohio	1892	s	g	" 24					
31	Chili (Hill's Chili)	Mich.	1888	l	r	" 22	Oct. 5	y r	y	s	Comes true from the pit.
32	Chili (Seedling 2)	Mich.	1888	l	r	" 22	" 7	y r	y	s v	Seedling by C. Engle.
33	Chili (Seedling 3)	Mich.	1888		r		" 7	y r	y	s v	Seedling by C. Engle.
34	Cleffey (Allen)	Mich.	1892	s	r						
35	Collister (McCollister)	Mo.	1891	s	r	May 24					
36	Columbia	Mo.	1891	l	r	" 22					
37	Conkling	Mo.	1890	l	r	" 22					
38	Coolidge	Mich.	1892	s	g	" 26		w r	p	v	Old and valued.
39	Corner	Mich.	1891	s	r	" 22	Oct. 5				An Allegan Co. seedling.
40	Crawford (Early)	Mich.	1888	s	g	" 22	Sept. 7	y r	y	v	Fruit buds not hardy.
41	Crawford (Seedling 1)	Mich.	1888	s	g	" 22	" 10	y r	y	v	Seedling by C. Engle.
42	Crawford (Seedling 2)	Mich.	1888	s	g	" 22	" 14	y r	y	v	Seedling by C. Engle.
43	Crosby	Mass.	1892	s	r	" 29					
44	Crothers	Tex.	1891	s	g	" 22	Oct. 9				Quality good here.
45	Cuba (Dwarf Cuba)	Mich.	1892		r						
46	Dennis	Mich.	1891	l	g	" 22					
47	Diamond	Ohio	1892	s	g	" 27					
48	Druid Hill	N. Y.	1891	s	g	" 22					
49	Dunlap	Mich.	1892	s	r	" 29					
50	Early York (Large)	Mich.	1892	s	g			w r	p	s v	Old, popular, market.
51	Ede (Capt. Ede)	Mich.	1890	s	r	May 22					
52	Elberta	Tex.	1890	s	r	" 22					
53	Eldred Cling	Mo.	1891	l	g	" 20	Aug. 30				
54	Ellison	Ohio	1889	s	r	" 23	Oct. 9	y r	y	s v	A promising market variety.
55	Engle (Mammoth)	Mich.	1891	s	g	" 22	Sept. 20	y r	y	v	Promising for market.
56	Foster	Mich.	1888	s	g	" 22	" 9	y r	y	v	Large and showy.
57	Fox	Mo.	1891	s	g	" 22	Oct. 9				

PEACHES—CONTINUED.

Number.	Name.	Origin.	Planted.	Flowers. l, large; s, small.	Glands. s, serrate; g, globose; r, reniform.	First bloom.	First ripe fruit.	Color. w, white; y, yellow; r, red.	Flesh. p, pale; y, yellow.	Flavor. s, sweet; v, vinous; a, acid.	Remarks.
58	Future Great	Mo.	1891	----	g						
59	Garfield	Mich.	1892	----	g						
60	Gem Cling	Tex.	1890	s	r	May 22					
61	George IV. (George the Fourth)	N. Y.	1888	s	g	" 22	Sept. 6	w r	p	s v	An amateur variety.
62	Globe	N. J.	1888	s	g	" 22	" 29	w r	p	v	Unproductive so far.
63	Gold Drop (Golden Drop)	Mich.	1890	l	r	" 22	---- ----	y	y	s	Probably an old variety.
64	Good	N. J.	1890	s	g	" 22					
65	Grant (Gen. Grant)	Mo.	1892	----	r	" 26					
66	Great Western	Mo.	1892	----	r						
67	Gudgeon (Late)	Mo.	1891	s	r	" 22	Oct. 17	w r	p	v	Late, promising.
68	Hale	Mich.	1888	l	g	" 22	Aug. 14	w r	p	v	Best and latest of the half clings.
69	Hale Oblong	Mich.	1888	l	g	" 22	" 18	w r	p	v	Seedling of C. Engle.
70	Hale Round	Mich.	1888	l	g	" 22	" 18	w r	p	v	Seedling of C. Engle.
71	Hance Golden	N. J.	1890	s	g	" 22					
72	Hance Smock	Del.	1890	s	r	" 22	Oct. 16	w r	p	v	Only one or two specimens.
73	Haas (John Haas)	Del.	1890	l	r	" 22	Aug. 30	w r	p	v	Promising.
74	Heath Cling	Del.	1890	s	g	" 22					
75	Hinman	Mo.	1891	l	r	" 22					
76	H. No. 34	N. Y.	1890								
77	Hold On (Geary's)	Mo.	1890	s	r	" 22	Oct. 12				
78	Hughes (IXL)	Mo.	1892	----	r						
79	Husted	Mich.	1891	l	r	" 22	Sept. 4	w r	p	v	
80	Hyatt	N. J.	1888	l	g	" 22	Aug. 28	w r	p	v	Finer than Hale.
81	Infant (Wonder)	Mo.	1892	s	g	" 24					
82	Ingold (Lady Ingold)	Mo.	1892	----	g	" 22					
83	Jacques	Mo.	1892	s	r	" 24					
84	Jacques Late	Mo.	1892	s	g	" 22					
85	Jones	Mo.	1882	s	g	" 24					
86	June Rose	Tex.	1890	l	g	" 22	Sept. 16	w r	p	s v	Promising.
87	Kalamazoo	Mich.	1890	s	r	" 22	Oct. 2	y	y	s v	Profitable for market.
88	Kaloola	N. J.	1892	----	g	" 22					
89	Kevitt Cling (McKevitt Cling	Mo.	1892	----	g	" 22					
90	Late Barnard	Mich.	1892	s	r	" 22					
91	Late Snow (Snow's Late)	Ohio	1890	s	r	" 22	Sept. 20	y r	y	s	Promising.
92	Late White	Mich.	1888	s	r	" 22	Oct. 7	w r	p	v	Seedling of C. Engle.
93	Lemon Cling	N. J.	1888	s	g	" 22	Sept. 25	y r	y	s v	An excellent cling.
94	Lewis	Mich.	1891	l	r	" 22	" 8				
95	Lock Cling	Mo.	1892	s	r	" 22					
96	Louise (Early Louise)	Mich.	1891	l	r	" 22					
97	Love All	Mo.	1892	s	g	" 24					
98	Lovett (White)	N. J.	1890	s	r	" 22					
99	Magdala	N. Y.	1890	s	r	" 22					
100	Mammoth Heath	Mo.	1892	l	r	" 22					
101	Marshall (Marshall's Late)	Ohio	1890	s	r	" 24					
102	Marshal Neil	Mo.	1892	l	r	" 22					
103	Milhizer	Mo.	1892	s	g	" 24					
104	Minnie	Tex.	1890	s	r	" 22					
105	Missouri (Blood Leaf)	Mo.	1892	----	r						
106	Moore (Moore's Fav.)	N. J.	1890	s	g	" 22	" 18	w r	p	v	Promising.
107	Morris County (Rareripe)	Del.	1890	s	r	" 22	Oct. 20				
108	Morris White	Mich.	1888	s	r	" 22	Sept. 29	w	p	v	Valued for canning.
109	Mountain Rose	Mich.	1888	s	g	" 22	" 4	w r	p	s v	Profitable.
110	Muir	N. J.	1890	s	r	" 24					
111	Murat	Mich.	1889								
112	Mystery (Yellow Mystery)	N. J.	1888	s	r	" 22	" 14	y r	y	v	Beautiful and good.
113	N. Amer. Apricot	Mo.	1892	----	r						

PEACHES—CONTINUED.

Number.	Name.	Origin.	Planted.	Flowers. l. large; s. small.	Glands. s, serrate; g, globose; r, reniform.	First bloom.	First ripe fruit.	Color. w, white; y, yellow; r, red.	Flesh. p, pale; y, yellow.	Flavor. s, sweet; v, vinous; a, acid.	Remarks.
114	Nectarine	N. Y.	1889	l	r	May 22	Oct. 7	w r	p	v	Beautiful, English.
115	Need (Need's Barnard)	Mo.	1892	s	r	" 22					
116	No. 34 H.	N. Y.	1890	l	r	" 22	Sept. 18	y	y	s	A yellow market peach.
117	Normand (Choice)	Mich.	1892	----	r						
118	Oldmixon Cling	Mich.	1888	s	g	" 22	Oct. 14	w r	p	v	Popular for a cling.
119	Ostrander (Early)	Mich.	1892	----	g						
120	Palmerston (Lord Palmerston)	N. Y.	1890	l	g	" 22					
121	Pansy	Tex.	1890	s	r	" 22					
122	Pearl	Mich.	1889	----	g	" 22	Sept. 25	w r	p	v	Seedling by C. Engle.
123	Picket (Late)	Mo.	1890	s	r	" 22	Oct. 18				
124	Pratt	N. Y.	1890	s	r	" 22	Sept. 13	y r	y	v	Promising.
125	Prince (Prince's Rareripe)	Del.	1890	s	g	" 22					
126	Princess (of Wales)	N. Y.	1889	l	g	" 22					
127	Prize	Mo.	1892	----	g						
128	Prize 1	Del.	1890	s	g	" 22					
129	Reed (Golden)	N. J.	1890	s	g	" 24					
130	Reeves (Favorite)	Mo.	1890	s	g	" 22					
131	Ringold	Tex.	1890	----	r						
132	River Bank	Mo.	1892	l	g	" 22					
133	Rivers (Early Rivers)	N. Y.	1888	l	r	" 22	Aug. 14	w r	p	v	Excellent for home use.
134	Rivers York (Riv. Ey. Yk.)	N. Y.	1890	l	g						
135	Roser	Mo.	1892	l	r	" 22					
136	Roseville Cling	Mo.	1892	l	g	" 22					
137	R. S. Stevens	N. Y.	1891	s	r	" 23					
138	Saint John	Del.	1890	s	r	" 22	Sept. 11	y r	y	s	Has many names.
139	Salway	Mo.	1890	s	r	" 22	Oct. 30	w r	p	v	Best very late.
140	Scott (Nonpareil)	Ohio	1890	s	g	" 20					
141	Sener	N. J.	1888	s	r	" 22					
142	Shipley	Mo.	1892	s	g	" 22					
143	Shipley Late	N. J.	1890	l	r	" 22					
144	Silver (Early Silver)	N. Y.	1888	l	r	" 22	Sept. 10	----	----	----	Pure white to the pit.
145	Smock Free	Mich.	1888	s	r	" 20	Oct. 27	y r	y	v	A standard late peach.
146	Smock X	Mo.	1892	----	r						
147	Southern Early	N. J.	1890	s	r	" 22					
148	Stark Heath	Mo.	1892	s	r	" 22					
149	Steadly	Mo.	1888	s	r	" 22	" 10	----	----	----	So far unproductive.
150	Stevens' Late	Del.	1890	s	r	" 22	" 17	----	----	----	Of doubtful value here.
151	Stevens' Rareripe	Del.	1890	s	r	" 22					
152	Strong (Mammoth)	Mo.	1892	s	g	" 22					
153	Stump (the World)	Mo.	1890	s	g	" 23					
154	Superb Cling	Mo.	1892	----	r						
155	Surpasse (Melocoton)	N. Y.	1890	s	r	" 23					
156	Surprise (Hynes)	Tex.	1890	l	g	" 22	Aug. 28	w r	p	v	Promising.
157	Switzerland	Mich.	1891	s	g	" 22					
158	Toquin	Mich.	1892	l	r	" 22	Sept. 19	y	y	s v	A market variety.
159	Townsend	Mo.	1892	s	g	" 22					
160	Troth (Early)	Mich.	1888	s	g	" 22	----------	----	----	----	A market variety.
161	Tuscany (Hardy Tuscany)	Mo.	1892	----	r						
162	Wager	Del.	1890	l	r	" 22	Oct. 7	----	----	----	Variety incorrect.
163	Walker	Mo.	1892	s	g	" 22					
164	Walker Variegated	Mo.	1890	s	g	" 22					
165	Waterloo	N. Y.	1888	l	r	" 22	Aug. 4	w r	p	v	Very early, promising.
166	Wheatland	N. Y.	1888	s	g	" 22	Sept. 18	w r	p	v	Desirable if productive.
167	Williamson (Choice)	Mich.	1892	s	g	" 22	" 20	y r	y	s	Promising.
168	Worthen (Jennie Worthen)	Tex.	1890	s	r	" 22	Oct. 24	y r	y	v	Of uncertain value.
169	Wonderful	Mich.	1890	s	r	" 23	Sept. 13	y r	y	v	Several varieties so named.
170	Yellow Rareripe	Mich.	1888	s	g	" 22					

NECTARINES.

Botanists class these with peaches, the chief difference being in their smooth skins.

Number.	Name.	Origin.	Planted.	Flowers. l, large; s, small.	Glands. s, serrate; g, globose; r, reniform.	First bloom.	First ripe fruit.	Color. w, white; y, yellow; r, red.	Flesh. p, pale; y, yellow.	Flavor. s, sweet; v, vinous; a, acid.	Remarks.
1	Pitmaston (Orange)	Mich.	1892	----	r						
2	Unnamed seedling	Mich.	1888	s	r	May 22	Sept. 12	w r	p	v	May prove desirable.

Very many of these tabulated varieties are but imperfectly tested here and are included to afford at least a partial means of identification through the flowers and leaf glands.

Short notices are given of the more desirable varieties whether for market or domestic purposes.

Barnard, Chili (Hill's Chili), Gold Drop, Gudgeon (Late), Hale, Kalamazoo, Mountain Rose, Stump (the World), and Salway (very late) are each and all more or less popular as market varieties.

In addition to these, Crawford (Early and Late), Foster, Oldmixon Free, and Smock Free are only less valued for such purpose on account of greater liability to the winter-killing of the fruit buds.

The delicate texture of many varieties to some extent unfits them to endure the rough treatment to which commercial varieties are usually subjected, while for this peculiarity they become the more desirable for home uses. Among such are the Crawfords (Early and Late), Foster, George IV, Hale, Rivers (Early), Surprise (Hynes), and Waterloo.

The very early varieties, Alexander, Amsden, Waterloo, and others, which with their typical parent, the Hale, are known as semi-clings, are quite inclined to rot before ripening. Still, if planted in an airy location, a few may prove desirable, at least in the home plantation.

Surprise (Hynes) obviously is one of this class, coming from Texas. A longer trial is needful to determine its value here.

Brigdon comes from central New York where it is deemed valuable for the market. It first fruited here this season.

Two seedlings of Chili (Hill's Chili), by C. Engle of Paw Paw, which have produced fine crops here this season are slightly later than the parent, more highly colored and of finer flavor.

The same is true of two Crawford (Early) seedlings from the same source, at least one of which promises well as a market variety.

Engle (Mammoth), also from the same, has already acquired some reputation as a market variety.

Hyatt and two Hale seedlings by Engle have produced fine, large crops of fruit; a little earlier, larger, more highly colored and less "clingy" than Hale. They give indications of value for both amateur and market purposes.

Morris White and Silver (Early Silver) are heavy bearers with clear

white flesh, not colored at the pit, and for that reason especially desirable for canning or preserving.

Ellison has borne a fine crop; fruit yellow, a good handler, and promising for the market.

Toquin, originating in the town of that name, and also a variety received for trial from New York with the cabalistic cognomen, "No. 34 H." have borne a few specimens each giving indications of adaptation to the market.

Wonderful, with a name apparently devised to promote sales, has borne a few specimens which prove wonderful, if at all, from their failure to justify the name.

A very considerable number of others have shown more or less fruit, but in most cases not sufficient to warrant an opinion as to their probable value.

GRAPES (*Vitis*).

With the exception of the very severe drouth of the past summer and early autumn, the season has been favorable for the grape.

The Rose chafer (*Macrodactylus subspinosus*), although very numerous on a number of plum trees on light soil, has, this season, been very rare upon the grape. A few grape vine flea beetles, (*Graptodera chalybea*), have been found, but not in considerable numbers.

Of fungi, powdery mildew and anthracnose, (*Spaceloma ampelinum*), have been somewhat troublesome, although almost wholly confined to varieties hybridized with *V. vinifera.*

The grapes, in common with the entire plantation, received a spray of Bordeaux mixture, of the usual strength, after pruning in the autumn of 1892, for the destruction of the resting spores of fungi.

Prior to the commencement of operations for the current year, plants were reserved as the basis of a set of experiments in the use of a variety of mixtures as preventives or remedies for fungi, as follows:

Of Moore Early, Salem, Ulster and Wyoming, five sets, of two plants each.

Of Brighton, six sets, of three plants each.

Of Concord and Niagara, six sets, of two plants each.

Of each variety, the first set was left unsprayed, as a means of comparison.

The second set of each of the four first named varieties was sprayed four times, on April 15, May 25, June 20 and July 10, with $\frac{1}{2}$ lb. copper sulphate, 1 lb. carbonate of ammonia in 32 gallons water.

The third set of the same received four sprayings on or near the same dates, with ammoniated copper carbonate in 32 gallons water.

The fourth set was sprayed at above dates, with modified Eau Celeste.

The fifth received a spray at same four dates with 1 lb. copper sulphate, $\frac{3}{4}$ lb. stone lime in 50 gallons water.

Upon examination made at the close of the growing season, upon the scale of 1 to 10:

Moore (Early)	No.	1	ranked	1	Wyoming	No.	1	ranked	2
"	"	2	"	3	"	"	2	"	1
"	"	3	"	4	"	"	3	"	3
"	"	4	"	4	"	"	4	"	1
"	"	5	"	2	"	"	5	"	1
Ulster	"	1	"	3	Salem	"	1	"	1
"	"	2	"	5	"	"	2	"	2
"	"	3	"	3	"	"	3	"	2
"	"	4	"	3	"	"	4	"	1
"	"	5	"	3	"	"	5	"	2

Of Brighton, Concord and Niagara, also, the first sets were not sprayed.

The second sets were sprayed but once, and that before growth commenced.

The third sets were sprayed once only, and that soon after blooming.

The fourth sets were sprayed on April 14, and again on June 15, using 4 lbs. copper sulphate, 3 lbs. stone lime, in 22 gallons water.

The fifth sets received three sprayings of the same on April 14, June 1 and July 1.

The sixth sets were sprayed four times with the same on April 14, May 27, June 20 and July 10.

Brighton	"	1	"	6	Niagara	"	1	"	2
"	"	2	"	5	"	"	2	"	2
"	"	3	"	4	"	"	3	"	1
"	"	4	"	3	"	"	4	"	2
"	"	5	"	2	"	"	5	"	4
"	"	6	"	1	"	"	6	"	2
Concord	"	1	"	2					
"	"	2	"	1					
"	"	3	"	1					
"	"	4	"	1					
"	"	5	"	1					
"	"	6	"	1					

In all these cases the defects were mainly in foliage rather than fruit.

The annual pruning of grapes having been completed, and the cuttings and fallen foliage removed and burned, on November 9 and 10, a thorough spray was given them for the purpose of destroying the spores of fungi.

It is clearly true that, in the interest of pomological accuracy as well as brevity, the use of numbers, whether in connection with names of fruits or otherwise, should never have been tolerated, and should be discouraged and abandoned, notwithstanding the fact that very many otherwise critical and careful pomologists still indulge in their use. In the interest of reform therefore, in this report, numbers attached to names are omitted, save in the case of trial varieties not yet offered to the public, and which have not yet established their right to receive a name.

Short notices are appended of several desirable, well known varieties, also of others, less generally known, and of yet others, comparatively new or yet unintroduced.

GRAPES.

Number.	Name.	Origin.	Planted.	Bunch. Size: l, large; m, medium; s, small.	Bunch. Form: l, long; m, medium; s, short; sh, shouldered.	Berry. Size: l, large; m, medium; s, small.	Berry. Form: r, round; o, oval.	First bloom.	Ripe.	Quality, 1 to 10.	Product, 1 to 10.	Remarks.
1	Adirondac	N. Y.	1890	l	l sh	l	r	June 24	Sep. 10-17	8	8	Plant of uncertain identity.
2	Agawam	Mass.	1888	l	l sh	l	r	" 24	" 17-24	7	8	A long keeper.
3	Aminia	Mass.	1888	m	sh	m	r	" 26	" 17-24	8	9	A Rogers' hybrid.
4	August Giant	N. Y.	1889	l	sh	l	o	" 26	" 24-Oct. 1	5	4	Identity doubtful.
5	Barry	Mass.	1888	l	sh	l	r	" 24	Sep. 17-24	8	7	Inclined to mildew.
6	Beagle	Texas	1889	m	sh	m	r	" 24	Oct. 5-10	6	7	Of medium quality.
7	Bell	Texas	1889	s	s	m	r	" 26	Sep. 17-24	4	--	Trial imperfect.
8	Belvidere	Ill.	1890	l	sh	m	r	------	------	3	9	Very early.
9	Berckmans	S. C.	1891	----	------	----	------	------	------	--	--	Not yet fruited here.
10	Black Eagle	N. Y.	1890	l	m sh	l	r	June 27	Sep. 10-17	3	9	A wine grape here.
11	Black Pearl	Ohio	1890	----	------	s	r	" 29	Oct. 3-10	--	--	Only a wine grape.
12	Blanco	Texas	1889	s	------	s	r	" 24	------	--	--	Needs further trial.
13	Brighton	N. Y.	1888	l	l sh	l	r	" 27	Sep. 17-24	10	7	Requires cross fertilization.
14	Brilliant	Texas	1889	s	s	l	r	" 28	" 17-24	3	--	Mildews badly.
15	Burnett	Ont.	1891	l	m sh	l	o	------	------	--	--	Try further.
16	Cambridge	Mass.	1890	l	sh	l	o	June 24	Sep. 10-17	6	8	
17	Campbell	Texas	1889	----	------	m	r	" 22	" 10-17	5	--	Imperfectly tested.
18	Catawba	S. C.?	1888	l	sh	m	r	" 27	Oct. 1-8	7	8	Scarcely ripens here.
19	Cayuga	N. Y.	1889	s	------	s	r	------	------	--	8	Needs a longer trial.
20	Caywood 50	N. Y.	1888	m	------	l	r	June 21	Sep. 10-17	6	9	Promising for market.
21	Centennial	N. Y.	1890	m	m sh	m	r	" 22	" 17-24	9	10	Foliage not healthy.
22	Challenge	N. J.	1890	s	sh	m	r	" 21	" 17-24	6	8	Very early.
23	Champion	N. Y.	1889	l	sh	m	r	" 24	Aug. 27-Sep. 2	3	8	Almost worthless.
24	Chidester 1	Mich.	1888	m	sh	m	r	" 26	Sep. 10-17	9	3	Good, but unprofitable.
25	Chidester 2	Mich.	1888	m	sh	m	r	" 27	" 17-24	6	8	Promising for market.
26	Chidester 3	Mich.	1892	----	------	----	------	" 26	" 10-17	--	--	First fruited.
27	Chidester 4	Mich.	1892	----	------	l	o	" 26	" 27-Oct. 2	8	--	Imperfectly tested.
28	Clark	Div Pom	1892	----	------	----	------	------	------	--	--	Cuttings from Div. of Pomology.
29	Clevener	N. Y.	1890	m	l	s	r	------	Oct. 3-10	6	7	Imperfectly tested.
30	Clinton	N. Y.	1891	s	s sh	s	r	June 21	" 3-10	3	10	Very acid till late.
31	Colerain	Ohio	1892	----	------	----	------	------	------	--	-	Awaits further trial.
32	Columbia	D. C.	1891	----	------	----	------	------	------	--	--	Vine a poor grower.
33	Concord	Mass.	1888	m l	l sh	m	r	June 21	Sep. 24-30	5	9	Standard market grape.
34	Cortland	N. Y.	1890	m	l	m l	------	" 21	Aug. 27-Sep. 2	4	8	Very early.
35	Cottage	Mass.	1890	m l	m	m	r	" 22	Sep. 10-17	4	5	Not valuable.
36	Crevelling	Penn.	1890	l	l	m	r	" 26	" 3-10	8	5	Early. Thin bearer.
37	Delaware	N. J.	1888	s	sh	s	r	" 22	" 17-24	10	10	Has few superiors.
38	Diamond	N. Y.	1889	l	sh	l	r	" 27	" 13-17	8	10	Amateur and market.
39	Diana	Mass.	1888	m	m	m	r	" 26	Oct. 8-15	7	7	A long keeper. Foxy.
40	Downing	N. Y.	1889	l	sh	l	o	" 24	Sep. 24-Oct. 1	8	7	Hybrid. Keeps late.
41	Dracut (Amber)	Mass.	1890	l	l sh	l	r	" 24	Sep. 10-17	3	7	Utterly unworthy.
42	Duchess	N. Y.	1888	l	l sh	m	r o	" 29	" 17-24	10	5	Mildews badly.
43	Early Market	Texas	1889	s	s	s	r	" 23	" 10-17	2	2	Not desirable here.
44	Early Victor	Kan.	1888	m	sh	m	r	" 26	" 3-10	8	7	Promising.
45	Eaton	Mass.	1888	l	sh	l	r	" 26	" 17-24	5	8	Showy. Market.
46	Elaine	Mich.	1889	----	------	----	------	" 26	" 14-24	--	--	C. Engle. Try further.
47	El Dorado	N. Y.	1889	l	sh	l	r	" 29	" 17-24	8	--	One of Rickett's seedlings.
48	Elvira	Mo.	1890	s	s sh	m	r	" 28	" 10-17	2	10	Not valuable here.
49	Empire State	N. Y.	1888	l	sh	m	r o	" 29	" 17-24	8	7	Excellent. White.
50	Essex	Mass.	1889	m	s sh	l	r	" 27	" 24-30	5	6	Not valuable.
51	Esther	------	----	----	------	----	------	------	------	--	--	Not yet fruited.
52	Etta	Mo.	1890	s	sh	m	r	June 28	Sep. 24-30	2	8	A wine grape.
53	Eugenie	N. Y.	1891	----	------	----	------	------	------	--	--	Not yet fruited.
54	Eumelan	N. Y.	1888	m	sh	s m	r	June 24	Sep. 17-24	7	8	Has many good qualities.

GRAPES—CONTINUED.

Number.	Name.	Origin.	Planted.	Bunch. l, large; m, medium; s, small.	Bunch. l, long; m, medium; s, short; sh, shouldered.	Berry. l, large; m, medium; s, small.	Berry. r, round; o, oval.	First bloom.	Ripe.	Quality, 1 to 10.	Product, 1 to 10.	Remarks.
				Size	Form.	Size.	Form.					
55	Eva	Penn.	1889	s	s	m	r	June 24		3	--	Unworthy.
56	Excelsior	N. Y.	1889	l	sh	l	r		Sep. 6	8	--	Of doubtful value.
57	Faith	Mo.	1891							--	--	Not properly tested.
58	Gaertner	Mass.	1889	m		m l		June 30		--	--	Needs longer trial.
59	Geneva	N. Y.	1891					" 26		--	--	Not yet fruited.
60	Goethe	Mass.	1889	m l	sh	l	o	" 26	Oct. 1-8	5	--	Too late for the north.
61	Golden Drop	N. Y.?	1889	s	s	s	r	" 27	Sep. 10-17	9	--	Vine unsatisfactory.
62	Golden Gem	N. Y.	1890	s	sh	s	r		" 24	10	--	Vine a slow grower.
63	Guinevra	Mich.	1891							--	--	C. Engle. Not yet fruited.
64	Hall	Mich.	1893							--	--	Not yet fruited.
65	Hartford	Conn.	1889	l	l sh	m	r	June 24	Sep. 10-17	2	10	Too poor. Fruit drops.
66	Hayes	Mass.	1888	m	sh	m	r	" 24	" 10-17	8	9	Excellent. White.
67	Herbert	Mass.	1889	l	m sh	l	r	" 26	" 10-17	7	8	Of fair quality.
68	Highland	N. Y.	1889	l	l sh	l	r	" 30		5	9	Does not ripen here.
69	Honey	Mich.	1891							--	--	C. Engle. Further trial.
70	Iona	N. Y.	1888	l	l sh	m	o	June 22	Sep. 17-24	10	5	Best, often fails.
71	Iris	Mich.	1891		sh	l	r	" 22	" 17-24	8	--	The first fruit.
72	Isabella	S. C.?	1888	l	l sh	l	o	" 24	Oct. 8-15	9	9	Needs a long season.
73	Ives	Ohio	1890	m l	sh	m	o	" 24	Sep. 10-16	4	9	A market grape.
74	Janesville	Wis.?	1889	s	s sh	m	r	" 21	" 27-30	4	10	Hardiness its chief merit.
75	Jefferson	N. Y.	1888	l	sh	m	r	" 29	Oct. 8-15	9	10	A long keeper. Excellent.
76	Jessica	Ont.	1888	s	s	s	r	" 23	Aug. 27-Sep. 2	10	8	Rich. Early. Seedy.
77	Jewell	Kan.	1889	m s	s	m s	r	" 27	Sep. 3-10	8	8	New. Try further.
78	Josselyn 5-2-1	N. Y.	1890	m	m sh	l	r	" 26	" 17-24	6	--	Its first fruiting.
79	Josselyn 7-2-1	N. Y.	1890							--	--	Not fruited.
80	Josselyn 9-2-1	N. Y.	1890		sh	m	r	June 29	Sep. 24-30	5	--	First bearing.
81	Josselyn 10-2-1	N. Y.	1890							--	--	Not fruited.
82	Lady	Ohio	1888	m s	s	m l	r	June 27	Sep. 10-17	9	7	Early. Sweet. Rich.
83	Lady Washington	N. Y.	1888	l	sh	m	r	" 27	Oct. 8-15	8	10	Ripens late. White.
84	Leader	Ohio	1890			m	r	" 21		6	--	But partially tested.
85	Leavenworth	Kan.	1890							--	--	Not yet fruited.
86	Lindley	Mass.	1889	m l	sh	l	r	June 27	Sep. 10-17	7	--	One of the Rogers' hybrids.
87	Lutie	Tenn.	1890	m	s sh	m	r	" 22	" 24-30	2	9	Foxy. Sweet, worthless.
88	Martha	Penn.	1890					" 26		--	--	Plant not true to name.
89	Mason	Mich.	1891							--	--	A Michigan seedling.
90	Massasoit	Mass.	1888	m	s	m l	r	June 22	Sep. 17-24	8	8	Anthracnose on fruit.
91	Merrimac	Mass.	1888	s	s	l	r	" 24	" 17-24	7	7	A vigorous grower.
92	Michigan	Mich.	1889	s	s	m l	r	" 27	" 10-17	7	--	Need further trial.
93	Mills	Ont.	1888	l	sh	l	r	" 27	" 17-27	8	9	A long keeper. Fine.
94	Minnesota	Minn.	1890	m	l	m	r	" 24	" 24-30	4	8	Showy. Not valuable.
95	Monroe	N. Y.	1889	m	sh	m	r	" 27	" 17-24	7	9	Seedling of western N. Y.
96	Moore Early	Mass.	1880	m	m	l	r	" 26	Aug. 27-31	4	6	For early market.
97	Moyer	Ont.	1888	s	s sh	m	r	" 27	Sep. 3-10	7	7	Very early. Amateur.
98	Naomi	N. Y.	1889	l	l sh	m	r o	" 29	Oct. 1-8	6	8	Value doubtful.
99	Nectar	N. Y.	1888	l	sh	s	r	July 5	Sep. 10-17	8	2	Unproductive. Poor foliage.
100	Niagara	N. Y.	1888	l	sh	l	r o	June 24	" 24-30	5	10	Vine vigorous, healthy.
101	Northern Light	Ont.	1890	m	l	m	r	" 28	" 17-24	8	--	Needs further trial.
102	Olita	Texas	1889					" 29		--	--	Needs further trial.
103	Oneida	N. Y.	1890	m	sh	l	r	" 26	Sep. 17-24	--	--	Give further trial.
104	Osage	Kan.?	1890			l	r	" 27	" 10-17	7	--	Needs further trial.
105	Owosso	Mich.	1890	l	s	l	r	" 28	" 17-24	5	10	Like Catawba, but earlier.
106	Ozark	Kan.?	1890	m	s sh	m	r	" 28		3	6	Not a table grape.
107	Palmer	N. Y.	1890	m	m	l	r	" 26	Sep. 10-17	6	5	Probably an old variety.
108	Peabody	N. Y.	1890	m	m sh	m	o	" 26	" 3-10	5	10	Flavor not pleasant.

GRAPES—CONTINUED.

Number.	Name.	Origin.	Planted.	Bunch. 1, large; m, medium; s, small.	Bunch. 1, long; m, medium; s, short; sh, shouldered.	Berry. 1, large; m, medium; s, small.	Berry. r, round; o, oval.	First bloom.	Ripe.	Quality, 1 to 10.	Product, 1 to 10.	Remarks.
109	Perkins	Mass.	1889	m	sh	m	o	June 24	Sep. 3-10	3	7	Foxy, very poor.
110	Pocklington	N. Y.	1888	l	sh	l	r	" 26	" 24-30	6	8	Foxy, showy, late.
111	Poughkeepsie	N. Y.	1888	s	m sh	s	s sh	" 27	" 17-24	10	1	Nearly a failure here.
112	Prentiss	N. Y.	1888	m	m	m	r o	" 27	" 10-17	10	8	A good keeper.
113	President (Lyon)	Texas	1889	s	s	s	r	" 24	" 17-24	6	1	Unworthy so far.
114	Progress	Kan.?	1890	s	s	l	r	" 26		6	--	Not fully tested.
115	Pulpless	Mich.	1892									C. Engle. Not fruited.
116	Purity	Ohio	1889	m	l	l	r	June 27	Sep. 8-15	6	6	Identity doubtful.
117	Rentz	Ohio	1889	l	sh	l	r	" 29	" 17-24	4	--	Needs further trial.
118	Requa	Mass.	1890	l	m sh	m	r	" 27	" 10-17	7	7	Another Rogers' hybrid.
119	Rochester	N. Y.	1890	l	m sh	m	r	" 22	" 10-17	6	10	Soon loses in flavor.
120	Rockwood	N. Y.?	189									Not yet fruited here.
121	Rogers 5	Mass.	1889	m l	s	l	r	June 27	Sep. 17-24	7	--	Sweet and rich.
122	Rogers 8	Mass.	1889	m	m	l	r	" 26	" 24-30	5	7	Rather late.
123	Rogers 24	Mass.	1889	m	m	l	r	" 27	" 17-24	4	7	Bunch often small.
124	Rogers 30	Mass.	1889	l	m	l	r	" 27	Oct. 1-8	6	--	Bunch often imperfect.
125	Rommell	Texas	1889	m	m sh	m	r	" 26	Sep. 17-24	3	6	Too far north.
126	Salem	Mass.	1888	l	s	l	r	" 24	" 17-24	6	7	Largest of Rogers' hybrids.
127	Secretary	N. Y.	1890	l	l sh	m	r o	" 24	" 10-17	10	9	Vine unhealthy.
128	Telegraph	Penn.	1890	m l	sh	m l	r	" 24	" 3-10	6	8	One of the early natives.
129	Themis	Mich.	1891									Engle. Not yet fruited.
130	Triumph	Ohio	1890	l	l sh	l	r	June 29	Oct. 15-22	8	10	Will not ripen here.
131	Ulster	N. Y.	1888	m	sh	m	r	" 22	Sep. 8-15	9	10	Excellent. Red.
132	Vergennes	Vt.	1890	m	l	l	r	" 24	" 24-30	6	7	A market grape.
133	Vesta	Mich.	1891									Engle. Not yet fruited.
134	Victoria	N. Y.	1890	l	l sh	m	r	June 25	Sep. 24-30	3	10	Variety is spurious.
135	Warder	Ill.	1892									From Div. Pom. Not fruited.
136	Wells	Mo.	1890	s	s	m	r	June 24	Sep. 8-15	2	--	Needs further trial.
137	White Ann Arbor	Mich.	1888									Has failed to fruit here.
138	White Beauty	Kan.	1890			s	r	June 25	Sep. 17-24	6	--	Needs further trial.
139	White Imperial	Kan.	1890	s	s	s	r	" 22	" 3-10	8	--	Promising, white.
140	Wilder	Mass.	1888	l	sh	l	r	" 24	" 17-24	8	8	One of Rogers' best.
141	Willis	Ill.	1890	m	sh	m	r	" 26	" 10-17	--	--	Plant probably spurious.
142	Winchell	Vt.	1889	l	sh	m	r	" 26	Aug. 27-30	10	10	Best of its season, early.
143	Witt	Ohio	1889					" 29	Sep 17-24	7	7	White Concord seedling.
144	Woodruff	Mich.	1888	l	s sh	l	r	" 24	" 24-30	4	7	Varies in quality.
145	Worden	N. Y.	1888	l	s	l	r	" 24	" 17-24	6	8	An improved Concord.
146	Wyoming	N. Y.	1888	s	sh	s m	r	" 24	" 10-17	3	6	Of little value.

Agawam is one of the numerous Rogers' hybrids, of fair quality. It keeps till March, with ordinary care, in a cool cellar.

Aminia is, by some good judges, considered the best of the Rogers' hybrids.

Beagle, Bell, Blanco, Brilliant, Campbell, Olita, President (Lyon), and Rommell, all seedlings of T. V. Munson of Texas, are now just in bearing, with little apparent promise, so far, of value in this, to them, far northern region. The fruit mildews badly, although thoroughly sprayed.

Brighton is very vigorous and productive, planted as it is here among other varieties, which may be supposed to insure the more perfect fertilization of its bloom. In quality it has few if any superiors, though it

soon begins to deteriorate, not retaining its fine flavor beyond early December.

Caywood (No. 50) was received in 1888 or 1889 for trial, from its originator, the late A. J. Caywood of Marlboro, New York. It has now fruited two or three years, giving promise of value for the market.

Chidester, Nos. 1, 2, 3 and 4, are Labrusca seedlings, by C. P. Chidester of this State, which give decided promise of value. Nos. 1 and 2 were exhibited for premium at the State fair in 1887, and the first premium was awarded to No. 1 by the State Horticultural Society, which named it President Lyon, the same name having been subsequently bestowed by T. V. Munson of Texas upon one of his seedlings (see tabular No. 113). The quality of No. 1 is excellent but, so far, it is a very thin bearer.

Cortland has, this season, produced a bountiful first crop here. It is very early, even earlier than Moore; large, black; it has a possible value as a market grape for that reason.

Delaware, here, proves quite as productive and profitable as Concord, since its beauty and superior quality, notwithstanding its diminutive size, insure higher prices in the market.

Diamond is early; both bunch and berry large; the plant is vigorous and productive. Its good quality and showy appearance render it a special favorite with the birds.

Goethe (a Rogers' hybrid), Highland (a Ricketts' hybrid) and Triumph, a hybrid by Campbell of Ohio, are all too late for the latitude of Michigan, save under exceptionally favorable conditions.

Guinevra, Honey, Iris, Michigan, Pulpless, Thermis and Vesta are seedlings originated by C. Engle of Michigan. So far as tested, several of them are of good quality. Several, if not all of them, are vigorous. A longer trial is needful.

Hayes, of medium season; Lady, early; Pocklington, rather late, and Lady Washington, still later, are amateur white grapes, with the exception of Pocklington, scarcely adapted to the market.

Iona stands out prominently as the finest of the high flavored class of American grapes. The late Edward Bradfield of Ada, Michigan, was eminently successful in growing and fruiting it, and the same, for a time, was true of Judge Ramsdell, even as far north as Traverse City, and yet, with most growers, it has proved a sad failure.

Isabella, one of the oldest of our native varieties, where it can be fully ripened, still stands high, even as a dessert grape. It is also a good keeper.

Janesville is valuable, if at all, for its earliness and abundant hardiness, which render it useful in trying locations in which better varieties would be likely to fail.

Jefferson, a cross of Concord and Iona, by Ricketts, is among the most desirable of long keepers. Its flavor is mild and pleasant and the pulp is very tender. It can be kept till March without special care.

Jessica is a very early white grape; small, white and very sweet; seeds large for the size of the berry.

Jewell, originated by the late John Burr of Kansas, is rather small in both bunch and berry, but, on account of its earliness and generally good qualities, it is one of the most desirable of black amateur grapes.

Of four varieties received for trial from Josselyn of New York, two have now fruited here, for the first time, one a black grape and the other

white. Both are promising, although they require more extended trial. They are yet nameless.

Lutie has been several years before the public and, so far, meets nearly universal condemnation. Although sweet, it is intolerably foxy. Undesirable for any purpose.

Niagara has apparently already acquired an assured position as the leading white market grape. Though not superior, if even equal to Concord in quality, here at least it is even more productive.

Owosso, a Michigan seedling, is somewhat like its reputed parent, the Catawba, though shorter in bunch and earlier in season.

Palmer is a large black grape, found growing in a garden here by the person whose name it temporarily bears. Since including it in the foregoing table, we learn that it is a seedling originated in New York by Mrs. Millington, who subsequently removed to this place, bringing the variety with her. Such being the fact, it should doubtless bear her name, rather than that here given. From its trial thus far, it seems likely to prove desirable as a market variety.

Poughkeepsie is very much like Delaware in fruit but, so far as grown here, the plant is the least vigorous and productive one upon the premises. It may be fairly considered worthless, certainly so here.

The variety received and fruited here as Purity, in color and general appearance of fruit might appropriately bear that name, but it is clearly not the genuine variety, as named and described by Geo. W. Campbell, the originator.

Rochester, originated by Ellwanger & Barry of Rochester, New York, is of fair quality, bunch large, and the plant a good grower and an abundant bearer.

Secretary, one of the best of the Ricketts' hybrids, so far as the fruit is concerned, but the plant is far from satisfactory, being of feeble habit and specially liable to mildew.

Ulster is high in quality and the plant very productive, though slightly lacking in vigor.

Winchell. This variety has been several years before the public under this name, which is that of the originator or discoverer. Originating, as it did, in Vermont, it has more recently been disseminated from a New England nursery as Green Mountain. Under pomological rules, the earlier name, being an appropriate one, is clearly entitled to precedence. The plant is vigorous and productive, and the fruit very early and of excellent quality.

Martha, as received and tested here, proves spurious, being a black grape.

Massasoit, Merrimac, Salem and Wilder are valuable, well known Rogers' hybrids; too generally known to require description or characterization.

Moore (Early) occupies a somewhat doubtful position as an early market grape of the Concord type. It has several competitors of higher quality.

Moyer is very early, sweet and pleasant. Bunch and berry rather small. An amateur grape only.

Nectar has small, imperfect foliage and has, so far, proved very unproductive.

Woodruff, named for its originator, a resident of Ann Arbor, Michigan, is a large, bright red, Concord seedling sometimes of very good quality but variable. The plant is very vigorous, and occasionally over productive to such extent as to seriously affect the quality of the fruit.

Worden is a typical Concord seedling, with a larger bunch and berry, of somewhat improved quality, as well as earlier. It is, to some extent, popular as a market variety.

Wyoming, occasionally known as Wilmington Red is, at the best, but a slight remove from the wild type and, with the many more recent and greatly improved varieties, it can scarcely be considered worthy of cultivation.

PLUMS (*Prunus*).

Insects have been less persistent, than in previous years, in their attacks upon the foliage and fruit of the plum.

A little Paris green was applied in connection with the spray, but jarring has been the chief reliance for defense against the "Little Turk."

Upon a few trees, growing in light soil, the rose chafer (*Macrodactylus subspinosus*), has been troublesome, as has been the case for several years; since poisonous sprays prove ineffectual hand picking was resorted to for their suppression.

The slug (*Eriocampa cerasi*), has been less troublesome this season than last and has yielded readily to a spray of tobacco water.

In common with the entire plantation, the plums received a spray of Bordeaux late last autumn.

On April 10 and 11, last, they were given a spray composed of 4 lbs. copper sulphate, 3 lbs. stone lime and 2½ oz. Paris green in 32 gals. water.

On June 8 they were again sprayed with the same preparation.

On June 28 a spray of kerosene emulsion was applied to subdue the slug, using ¾ lb. soap, 2 gals. kerosene in 10 gals. water.

July 14 and 15 a spray was applied, using 2 lbs. copper sulphate, 1½ lbs. lime and 2½ oz. Paris green in 32 gals. water. Several varieties of plums lost more or less of their older foliage, apparently as the result of this last application. (Due probably to the use of air slaked lime.)

Aug. 7 and 8 they received a final spray of tobacco water, to subdue the slug which had again appeared in considerable numbers.

The following table includes only such varieties of plums as have bloomed and fruited (one or both) this year.

The species to which several of these varieties should be assigned is yet an open question among botanists for which reason, in such cases, a mark of doubtfulness is appended.

This being the first crop of nearly all the varieties of plums here tabulated and the crop, in most cases, comprising but few specimens, it seems inexpedient to venture upon descriptions or estimates of values. These are, therefore, deferred to await subsequent developments.

PLUMS.

No.	Name.	Species.	Planted.	Bloomed.	Ripened.
1	Bailey	Domestica	1889	May 22	Aug. 30.
2	Black Prune	Domestica	1888	" 22	Sept. 1.
3	Botan	Hattan	1890	" 19.	
4	Bradshaw	Domestica	1890	" 22.	
5	Burbank, 2	Domestica?	1890	" 18.	
6	Burbank, 11	Domestica?	1890	" 19.	
7	Cheney	Americana	1888	" 20	" 1.
8	Cook (Choice)	Americana?	1890	" 24.	
9	De Soto	Americana	1888	" 22	" 15.
10	Englebert	Domestica	1890	" 24.	
11	Forest Garden	Americana	1889	" 22.	
12	Forest Rose	Hortulana var. Mineri	1890	" 24.	
13	Golden (Beauty)	Hortulana	1890	" 27	Oct. 7.
14	Hawkeye	Americana	1888	" 22.	
15	Jewell		1890	" 27.	
16	Kingston	Domestica	1890	" 19.	
17	Long Fruited	Hattan	1890	" 22.	
18	Maquoketa	Americana	1888	" 24	" 7.
19	Marianna	Cerasifera Hyb.?	1890	" 27.	
20	Merunka	Domestica	1888	" 22	Aug. 16.
21	Masu	Hattan	1890	" 19.	
22	Miner	Hortulana var. Mineri	1890	" 24.	
23	Moore (Arctic)	Domestica	1890	" 18.	
24	Moreman	Hortulana	1890	" 30.	
25	Ogon	Hattan	1890	" 20	" 11.
26	Pottawatomie	Angustifolia	1888	June 1	" 14.
27	Prairie (Flower)	Hortulana var. Mineri?	1890	May 24	Oct. 10.
28	Red Nagate	Hattan	1890	" 27.	
29	Robinson	Angustifolia	1890	" 30	Sept. 8.
30	Rollingstone	Americana	1888	" 22	" 7.
31	Satsuma	Hattan	1890	" 22	Oct. 5.
32	Shiro Sinomo	Hattan	1890	" 19	Aug. 12.
33	Simon	Simoni?	1888	" 15	" 12.
34	Twenty Orel	Domestica	1888	" 22.	
35	Van Buren	Americana var.	1890	" 22.	
36	Weaver	Americana	1890	" 22.	
37	White Nicholas		1890	" 22.	
38	Wolf	Americana	1888	" 24	Sept. 14.
39	Yosebe	Hattan	1890	" 15	July 26.
40	Moldovka	Domestica	1888	" 22	Aug. 22.

Bailey is the name temporarily attached to a variety of the common garden plum of the east, which was received, in scion, from S. S. Bailey of Kent county, Michigan. It proves to be very vigorous, of upright habit and the fruit is of more than medium quality and size. It has produced a few fruits this season for the first time here.

Black Prune, Merunka, Moldovka and Twenty Orel are varieties imported by Prof. Budd, of Iowa, from northeastern Europe. They are of the *domestica* species and, should they prove productive, may be found desirable here.

Botan, (foisted upon the public as *Abundance*, for the apparent purpose of promoting sales) Long Fruited, Masu, Ogon, Red Nagate, Satsuma, Shiro Sinomo and Yosebe are varieties coming from Japan. Satsuma is of a type distinct from all others. It is large, round and very dark purple in both skin and flesh. Yosebe is notable for its extreme earliness, it being more than a week in advance of any other variety though not of high quality.

Bradshaw, Englebert, and Moore (Arctic) are extensively known as market varieties, wherever the *domesticas* are successful.

Burbank Nos. 2 and 11 are understood to have originated with that noted experimenter, Luther Burbank of California. They have blossomed here the past season but have not fruited.

Cheney, Cook, DeSoto, Forest Garden, Forest Rose, Golden (Beauty), Hawkeye, Jewell, Maquoketa, Miner, Moreman, Pottawatomie, Prairie (Flower), Rollingstone, Van Buren, Weaver and Wolf are all more or less generally known and valued, at the north and west, where the finer eastern varieties fail.

Kingston and (White) Nicholas have had but a short and imperfect trial here and have not yet shown their qualities sufficiently for characterization.

Marianna is far better known for its ability to root readily from cuttings and afford a supply of stocks for the nursery than for its value as a producer of fruit.

Robinson proves to be a vigorous grower and has, the past season, produced a fine crop of good sized, pleasant-flavored fruit; quite superior to most if not all the native western varieties that have so far fruited here.

Simon (Prunus Simoni of nursery catalogues), has now fruited here profusely; the large, bright colored, very peculiar fruit, as grown here, is far from agreeable in flavor. Botanists seem to consider it a sort of Ishmaelite among plums having specific characteristics peculiar to itself.

PEARS. (*Pyrus communis.*)

The unprecedented drouth of the past season had, apparently, little injurious effect upon the pear perhaps on account of the deep rooting habit of the species.

The spray of Bordeaux, given late in the autumn of 1892, was followed on June 12, 1893, with a spray composed of 4 lbs. copper sulphate, 3 lbs. lime and 2½ oz. Paris green in 32 gallons of water.

On June 28 the pears received a spray of kerosene emulsion, applied to subdue the slug (*Eriocampa cerasi*).

On July 10 to 13 a final spray was applied, consisting of 2 lbs. copper sulphate, 1½ lbs. lime and 2½ oz. Paris green in 32 gallons of water. This application, which injured the foliage of peaches, plums and cherries, occasioned no preceptible injury to that of pears.

The blight which, late in 1892, ruined a few pear trees, has again appeared this season, upon a tree of Seedless (Bessemianka), which, when discovered, were promplty cut back to apparently healthy wood. Indications, however, point to its probable reappearance next season. This appearance of blight in two successive seasons, in both cases upon Russian varieties, may be supposed to indicate a special liability to such attacks; since both were standing upon rather moist soil, this might be supposed to have induced the attack, but for the circumstance that they were alternated with Bosc, Anjou and Mount Vernon, which remain in obviously healthy condition.

The foliage of the pears has been exempt from leaf spot (*Fusicladium dendriticum*) (which attacks both foliage and fruit of the apple and pear), except that three or four trees of Jones and Mount Vernon pears (which perchance may have been omitted in the spraying), have been seriously attacked.

The following varieties have bloomed this season, and a few fruits have been brought to maturity.

No.	Variety.	Bloom.	Ripened.	Remarks.
1	Ansault	May 22	Nov. Dec.	European. Promises well.
2	Bloodgood	" 22	Aug. 23	An excellent amateur pear.
3	Clapp Favorite	" 29	Sept.	Large, good; soon rots at the core.
4	Dana Hovey	" 24	Winter	A small fruit, of high quality.
5	Gakovska	" 24		An importation from Russia.
6	Howell	" 22	Oct.	A good market and home fruit.
7	Lawrence	" 22	Winter	A desirable winter variety.
8	Lucrative	" 27	Sept.	A superior pear for home use.
9	Mount Vernon	" 22	Nov. Dec.	A very good amateur pear.
10	Rostiezer	" 27	Aug.	Not beautiful, but excellent.
11	Seckel	" 27	Oct.	The standard of high quality.
12	Victorina	" 24		Russian, not yet fruited.
13	Winter Nelis	" 27	Dec.	The prince of winter pears

APPLES (*Pyrus malus*).

The severe attack of scab, *Fusicladium dendriticum*, of last year so enfeebled the apple trees that, in most cases, few fruit buds were developed and, doubtless for this reason, at least in part if not wholly, there was a decided paucity of bloom last spring. There were, however, a few notable exceptions, prominent among which were the Keswick and Oldenburg, both of which were, in a great measure, exempt from scab last year, and have produced fine crops of perfect fruit this season.

The green aphis (*Aphis mali*) has proved somewhat persistent this season, yielding reluctantly to sprays of kerosene emulsion, and tobacco water, both of which were applied in turn. No other insects have, to a serious extent, infested the apple during the season, except that a very few fruits were found to be inhabited by the larvæ of the codling moth, which were promptly gathered up and effectually disposed of.

A very considerable number of varieties of apple (as well as of other fruits) were received, in cion, from the National Division of Pomology, on the 28th of March last, coming originally, as is understood, from eastern or northeastern Austria. These were topgrafted upon trees in orchard, heretofore planted for such purpose, and also cions of each variety were inserted in nursery stocks, as a precaution against the loss of a variety. These are expected to be in condition to be planted out the coming spring.

Aside from the general spraying in November, 1892, which included the apple, additional sprayings have been applied as follows:

On June 12, a spray composed of 4 lbs. copper sulphate, 3 lbs. lime and 2½ oz. Paris Green, in 32 gallons of water.

On June 22, a spray of kerosene emulsion, to subdue the aphis.

On August 5 to 8, a spray of strong tobacco water, for the same purpose.

Whether as the result of the sprayings specified, or otherwise, the foliage of the present season has nearly or quite resumed a healthy condition, and the trees generally have nearly or quite recovered their pristine condition.

The following varieties have bloomed and matured fruit the past season:

No.	Name.	Bloomed.	Ripened.	Remarks.
1	Borovinka	May 24	Sept.	This proves to be identical with Oldenburg (as pr. Downing, page 102).
2	Keswick (Codlin)	" 23	Oct.	This resists the scab, having fruited last year and produced a heavy crop this year.
3	Titovka	" 29	Sept.	
4	Winter Streifling	" 25	Oct.	

It will be observed that Nos. 1, 3 and 4 are Russian or East European varieties, while No. 2 is English. This last has no superior if indeed it has an equal in this climate as a hardy tree, bearing early and profusely. It is strictly a culinary fruit, for which purpose it scarcely has an equal.

QUINCES (*Cydonia*).

The quince during the two years last passed has been notably free from insect depredations. The vigorous condition of the plants may perchance have contributed to this apparent exemption, since many insects seem to avoid healthy vigorous trees, devoting themselves rather to such as may be enfeebled or diseased.

The slug (*Eriocampa cerasi*) made its appearance at the usual season.

There has been no indication of fungus upon either plant or fruit, which was undoubtedly due to the use of fungicides, as in former years there has been much injury from leaf-blight.

The plants were treated with a spray of kerosene emulsion on June 20 to subdue the slug, and a spray of tobacco water was applied on August 5 to 8 for the same purpose and with similar result.

Varieties of quince have bloomed and fruited this season as follows:

No.	Name.	Bloomed.	Ripened.
1	Alaska	May 7	No fruit.
2	Champion	June 5	Last of October.
3	Fuller	May 18	No fruit.
4	Meech	June 5	Last of October.
5	Missouri (Mammoth)	" 5	No fruit.
6	Orange	" 5	October.
7	Rea	" 5	October.

Champion is vigorous and very prolific but rather late.

Meech is in season about with Champion.

Orange is yet at the head, so far as season and general desirability are concerned.

Rea is much like Orange so far as appearance and size are concerned.

NUTS.

Seedlings from the large native Hathaway chestnut (*Castanea vesca*), planted in 1888, have this season shown a few catkins, but failed to set fruit.

Paragon, which has for three or four seasons produced only abortive nuts, has this season ripened a very large crop (for so young a tree), the branches being so heavily loaded with the large burs that more than half were removed early in the season to insure the development of the remainder. The nuts were frequently three in a bur, of the usual size of the imported ones, and superior in quality, ripening about with our natives.

Among the varieties received and planted as Japanese chestnuts, one received as "Japanese Imported, grafted," planted in 1890 and now less than seven feet in height, has this season ripened a fine crop of large nuts. The burs are even smaller than those of our natives, usually containing but a single large round nut. They ripen at the usual season.

The European or Spanish chestnut, planted in 1890, has also shown a little fruit the past season.

CHINQUAPIN (*Castanea pumila*—or Dwarf chestnut).

Owing to the inability of this to bear transplanting, the nuts have been two or three times obtained and planted, but so far without success. Another lot has been obtained and planted this fall, the nuts coming from Tennessee.

PECAN (*Hickoria olivæformis*).

Nuts of pecan were received from southern Iowa and planted here in the fall of 1888. They prove hardy, so far, and this season have made good growths. The Stuart pecans, received from the Division of Pomology, have grown and have been protected for the winter since, coming as they do from Texas, their hardiness in the climate of Michigan must be regarded as very doubtful.

ENGLISH WALNUT, OR MADEIRA NUT (*Juglans regia*).

This was planted in 1889 and, so far, has not winter-killed and has made moderate, healthy growths.

Dwarfs of this species, under the name *Præparturiens*, were also planted in 1890 and have, so far, suffered no apparent injury from our winters.

JAPAN WALNUT—(*Juglans Seiboldi.*)

This was planted in 1890, and has proved perfectly hardy here. It is a very vigorous grower, and has matured fruit here this season. In both tree and fruit it is much like our indigenous Butternut, though more vigorous. So far the fruit is scarcely equal to the Butternut.

ALMONDS—(*Amygdalus communis.*)

The Luelling almond, received from a Missouri nursery and planted in 1892, has proved hardy here, but has not yet fruited.

The "Soft Shelled Almond," planted here last year, proves hardy so far.

FILBERTS AND HAZEL-NUTS—(*Corylus.*)

The Kentish Cob Filbert planted in the spring of 1892 has withstood the past winter unharmed, and has made satisfactory growth this season. It is promises to fruit next season.

The unnamed Hazel-nuts from the Division of Pomology planted last spring may be expected to more fully develop their peculiarities during next season.

FIGS—(*Ficus carica.*)

The cuttings of Brunswick Fig, from H. E. Van Deman rooted here last season, were planted permanenty last spring. They are showing partially developed fruit this fall, and have now been laid down and covered with earth and litter to protect them from the alternate freezing and thawing of winter.

SOUTH HAVEN, MICHIGAN,
Nov. 24, 1893.

T. T. LYON.

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MICHIGAN FRUIT LIST.

L. R. TAFT.

With the long list of varieties found in the fruit catalogues of our State and National horticultural societies, and the even more confusing ones in the nurserymen's list, it becomes a difficult matter to make a desirable selection, unless a person has a definite knowledge of the varieties that succeed best in the locality where he lives.

While a few varieties seem to thrive in nearly all sections, others that may be very valuable in some localities, are nearly worthless elsewhere, owing to the unsuitable conditions of climate or soil. It will be impossible, then for any one list to suit the wants of all persons. In order to learn the opinion of the growers in the different sections of the State as to the best varieties for their respective localities, a circular was last summer sent to some two hundred fruit growers asking their aid in the preparation of a fruit list for Michigan. The circular contained the last fruit list for this state issued by the American Pomological Society, and the varieties there given were marked by the correspondents with various symbols to indicate their value for the different localities. In several instances the lists were considered by the local horticultural societies, and votes were taken to determine the mark that should be given them.

The symbols used to indicate the value of the different varieties were as follows: two stars (**) when they were generally successful in the particular locality and were worthy of being placed in every list; one star (*) for varieties that were less generally successful and that were of less value than those given two stars; a dagger (†) indicated new and promising varieties and a dash (—) that the varieties were of no value and should

be stricken from the list. A great difference of opinion was noticed in the returns, as, in a few cases, varieties were given two stars by some persons while others in the same county marked them with a dash. As a rule, however, a remarkable unanimity of opinion was shown, not only in the different counties, but in the dozen or more counties that go to make up one of the sections. So far as concerns the varieties marked with two stars, there seems to be but little difference in the rating given them, except that they are occasionally dropped out in the northern counties on account of their lateness or lack of hardiness.

The varieties marked with two stars in the following list were rated in that way by a majority of the correspondents in the different sections into which the State is divided, and, as will be seen they appear to be adapted to nearly all sections. Those marked with a single star received a minority of the votes for the two star list, or were regarded as worthy of one star by a considerable number of persons. The fact that a fruit is thus marked indicates that it has considerable value, but that as a rule the varieties with two stars are of more value and that, unless a long list is desired, it should not be selected. There are, for various reasons, exceptions to this rule, and so far as possible they will be explained in the in the notes that follow each class of fruits.

When a variety is marked with a star followed by an interrogation mark (* ?), it indicates that its use is favored by a few persons, but it is regarded as less desirable for general planting than those given one star. For certain purposes and in some localities it may be worthy of trial.

We have dropped from the list all varieties that were given a dash by a majority of those reporting upon them, or where there have not been as many as five persons from the entire State who thought them worthy of either one star, or a dagger.

The dagger has been here given to such new kinds as have been sufficiently tested in the State to warrant the statement that they are at least promising and worthy of trial upon a small scale. In the notes, mention is also made of some of the new varieties that have done well in other States but which have not yet been sufficiently tested in Michigan to determine their value, although most of them are under trial.

In dividing the State into sections we have placed in the Southern Lake Shore division all of the counties bordering Lake Michigan south of Muskegon, and in the North Lake Shore section all north of and including Muskegon. The two southern tiers of counties are considered to be in Southern Michigan; the three tiers north of this make up Central Michigan, and the counties north of Gratiot are considered as in Northern Michigan.

APPLES.

The List of Apples will enable any intelligent person to select a collection that will be reasonably certain to succeed in his locality, and by noting the column marked "Use" the particular purpose for which they are valued can be learned.

Particular thought should be given to this as upon it the selection should depend. In making out a list for home use, we should not only select kinds that are healthy, vigorous trees and abundant bearers, but it should include both sweet and tart sorts, and afford a supply throughout the season of both dessert and cooking varieties. To secure this, one will

need to have from fifteen to twenty varieties in the orchard designed for family use. Of the summer and fall sorts one, or at most two, trees of a kind will answer unless fruit is desired to sell or give away, but of the winter sorts a larger number is desirable, in order to be sure of a supply in years of partial failure; if there is a surplus at any time a ready sale can always be found for well grown fruit of desirable sorts.

APPLES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. FORM—r c, roundish conical; r ob, roundish oblate; r, roundish. COLOR—y r, yellow and red; r s, red striped; g y, greenish yellow; rus, russeted; y rus, yellow and russet. QUALITY—g, good; v g, very good; b, best. USE—F, family use; K M, kitchen and market; F M, family and market. SEASON—S, summer; E A, early autumn; L A, late autumn; W, winter. ORIGIN—Usual abbreviations for names of countries.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Alexander	l	r c	r s	g	K M	E A	Rus.	*	*	*	*	*
Autumn Bough	m	r c	g y	v g	F	E A	Am.	*?	*?	------	*?	------
Bailey Sweet	l	r c	r s	v g	F M	L A	Am.	*	*	*	**	*
Baldwin	l	r c	r g	v g	F M	W	Am.	**	**	**	**	**
Belmont	l	r c	y r	b	F M	W	Am.	*	*	*	*	------
Ben Davis	l	r c	y r	g	K M	W	Am.	**	*	*	**	*
Benoni	m	r ob	y r	v g	F M	S	Am.	*	------	*	*?	------
Blenheim Pippin	l	r ob	y r	v g	F M	W	Eng.	*?	------	*?	*?	------
Blue Pearmain	l	r c	r	g	M	W	------	*	------	*	------	------
Bough	l	ob	g y	v g	F M	S	Am.	**	*	**	**	*
Bullock, (Am. Golden Russet)	s	r c	y rus	b	F M	W	Am.	*?	------	*	*	------
Canada Reinette	l	r c	g y	v g	F M	W	F.	*?	------	------	*	------
Chenango (Strawberry)	m	ob c	g r	v g	F M	E A	Am.	*	*	**	**	*
Clayton	l	c	y r	g	F M	W	Am.	*	------	†	†	------
Colvert	l	r ob	y r	g	F M	L A	Am.	*	*?	*?	*	------
Dyer (Pomme Royal)	m	r	g y	v g	F	E A	F.	*?	------	*?	*?	------
Early Harvest	m	r ob	g y	v g	F M	S	Am.	*	*?	*	*	*
Early Joe	s	fl	y r	b	F	S	Am.	*	*?	*	*	------
Early Strawberry	s	r	r s	v g	F	S	Am.	*	*	*	*	*
Esopus	l	ob	y r	b	F M	W	Am.	*	*	*	*	------
Fallawater (*Tulpehocken*)	l	r c	g y	g	M	W	Am.	*	*	*	*	*
Fall Jenneting	l	fl	g y	g	M	E A	Am.	*	------	*?	*?	------
Fall Orange	l	r	y r	g	K M	L A	Am.	*	------	------	*	------
Fall Pippin	l	r ob	g y	v g	F M	L A	Am.	*	------	*?	*	*
Fameuse (*Snow Apple*)	m	r ob	r s	v g	F M	W	F.	*	*	*	*	*
Garden Royal	m	r ob	y r	b	F	S	Am.	*?	------	------	*?	------
Gideon	------	------	------	------	------	------	Am.	†	†	†	†	†
Golden Russet (N. Y.)	m	r ob	y rus	v g	F M	W	Am.	*	*	*	**	*
Golden Sweet	l	r	g y	v g	F M	S	Am.	*	*	*?	*	------
Golding	l	r ob	g y	v g	F M	W	Am.	*?	*?	*?	*?	------
Gravenstein	l	r ob	y r	v g	F M	L A	Ger.	*	*	*	*	*
Grimes	m	r ob	g y	v g	F	W	Am.	**	*	**	**	------
Hubbardston (*Nonesuch*)	l	r c	y r	v g	F M	W	Am.	**	**	**	**	------
Jefferis	m	r ob	y r	v g	F M	E A	Am.	*	*	*	*	------
Jersey Sweet	m	r	y r	v g	F M	E A	Am.	*	*	*	*	------
Jewett Red	m	r ob	r	g	F M	W	Am.	*?	*?	------	*?	------
Jonathan	m	r c	y r	v g	F M	W	Am.	**	**	**	**	**
Keswick	m	r c	g y	g	K M	E A	Eng.	*	*	*	*	------
Lady	s	fl	y r	v g	F M	W	F.	*	------	*?	*?	------
Lady Sweet	l	r	y r	v g	F M	W	Am.	*	------	------	*?	------
Late Strawberry (*Autumn*)	m	r	y r	v g	F M	L A	Am.	*	*	*	*	*
Lowell (*Tallow Pippin*)	l	r c	g y	v g	F M	E A	Am.	*	------	*	*	------
Maiden Blush	m	r	g y	g	F M	E A	Am.	**	**	**	**	*
Mann	m	r ob	y r	v g	F M	W	Am.	*	*?	------	*	*
Melon	m	r ob	y s	b	F M	W	Am.	*	------	*	*	------

APPLES.—CONTINUED.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Monmouth	l	fl	yr	vg	F M	W	Am.	*	------	*?	*?	------
Mother	m	r c	yr	b	F M	W	Am.	*	*?	*?	*	------
Munson (*Orange Sweet*)	m	fl	y g	g	K M	L A	Am.	*	*?	*?	*?	------
Newton (Spitzenburg)	m	r ob	yr	b	F M	W	Am.	*	------	*	*?	*?
Northern Spy	l	r c	yr	b	F M	W	Am.	**	**	**	**	**
Oakland (Co. Seek-no-further)	m	r ob	yr	v g	F	W	Am.	*	*	*?	*	------
Oldenburg (Duchess of)	m	r ob	yr	g	M	S	Rus.	**	**	**	**	**
Ortley (*White Bellflower*)	m	ob	g y	v g	F M	W	Am.	*	------	*	*?	------
Peck	m	r	g y	v g	F M	W	Am.	*	*	*	*	*
Perry Russet	m	r c	rus	g	F M	W	Am.	*?	------	*?	------	------
Pewaukee	l	fl	r s	g	F M	W	Am.	------	*?	------	*?	*?
Porter	l	ob	g y	b	F M	A	Am.	*	*	*	**	------
Primate	m	r c	g y	b	F	E A	Am.	**	*	*	**	------
Pumpkin Sweet (*Pound Sweet*)	l	r obl	y	g	K M	E W	Am.	*?	------	*?	*?	------
Rambo	m	fl	yr	v g	F M	L A	Am.	*	*	*?	*	*?
Rall	l	r c	yr	v g	F M	W	------	*	*	*?	*	*?
Red Astrachan	l	r	yr	g	K M	S	F.	**	**	**	**	**
Red Canada (*Steele's Red*)	m	r ob	yr	b	F M	W	------	**	**	*	**	*
Rhode Island Greening	l	r ob	g y	v g	F M	W	Am.	**	*	*	*	*
Ribston	m	r	yr	v g	F M	W	Eng.	*	*	*	*	*
Rome Beauty	l	r	yr	g	M	L A	Am.	*?	------	*?	*?	------
Roxbury Russet	m	r ob	y rus	v g	F M	W	Am.	*	*	*	*	*
Saint Lawrence	l	fl	yr	v g	M	A	------	*	*	------	*	*
Shiawassee	m	fl	r y	v g	F M	A	Am.	**	**	**	**	**
Smith (*Cider*)	l	r ob	yr	g	F M	W	Am.	*	------	*?	*?	*?
Stark	l	r c	yr	g	F	W	Am.	**	*?	*	*?	------
Summer Pearmain (*American*)	m	ob	yr	b	F	S	Am.	*	------	------	*?	*
Summer Pippin	m	ob c	yr	g	K M	L S	Am.	*	------	------	*?	------
Summer Queen	l	r c	yr	g	K M	S	Am.	*	*?	------	------	------
Swaar	l	r ob	g y	b	F M	W	Am.	*	*	------	*	*
Tetofsky	m	fl c	yr	g	K	S	Rus.	*	*	*?	*	*
Talman	m	r	g y	v g	K M	W	Am.	**	**	**	**	**
Tompkins King	l	r	yr	v g	F M	W	Am.	**	**	*	**	**
Twenty Ounce (*Cayuga Red*)	l	r	r s	v g	F M	L A	Am.	**	**	*	**	*
Wagener	m	r ob	yr	b	F	W	Am.	**	**	*	**	**
Walbridge	l	r ob	r s	v g	F	W	Am.	†	†	†	*?	*?
Wealthy	m	r ob	r	v g	F M	W	Am.	*	**	------	*	**
Westfield (Seek-no-further)	l	r c	yr	b	F M	W	Am.	*	*	*	**	*
Williams	m	r c	yr	g	M	S	Am.	*	------	*	*?	------
Winesap	m	r	yr	v g	F M	W	F.	------	------	*	*	------
Wolf River	l	r ob	r	g	F M	W	Am.	*	------	------	*?	------
White Bellflower	l	ob	g y	v g	F M	W	Am.	*	*	*	*	------
Yellow Newtown	l	r ob	g y	v g	F M	W	Am.	*	*	*?	*	------
Yellow Transparent	m	r ob	y	g	K M	E S	Rus.	*	*	*	*	------

For nearly all sections of the State the following twenty varieties will make a good family collection:

Red Astrachan, Bough (Sweet), Oldenburgh, Primate, Chenango, Keswick, Maiden Blush, Shiawassee, Twenty Ounce, Bailey (Sweet), Westfield, Jonathan, Hubbardston, Grimes, Baldwin, Talman, King, R. I. Greening, Red Canada, N. Spy, and Golden Russet (N. Y.).

As a second choice some of the following could well be used: Early Harvest, Yellow Transparent, Tetofsky, Williams, Early Strawberry, Early Joe, Alexander, Lowell, Gravenstein, Fameuse, Colvert, Porter, Fall Pippin, St. Lawrence, Jefferis, Bullock, Canada Reinette, Wealthy, Esopus, Late Strawberry, Oakland, Mother, Peck, Rambo, Rall, Swaar, Winesap,

Yellow Bellflower, and Roxbury Russet. Wagener succeeds well in the northern counties, and there would be in the two star list.

Of the varieties given in the second list, President Lyon recommends the following for a place in the first list for a family collection: Early Harvest (or Yellow Transparent), Early Strawberry, Jefferis, St. Lawrence and Roxbury Russet. He would also retain in the fruit list such apples as Cogswell, Manomet, McClellan and Mexico, which are certainly valuable sorts for dessert or cooking purposes.

In the third class, marked * ?, are such kinds as Autumn Bough, Blenheim, Dyer, Fall Jenneting, Fall Orange, Garden Royal, Golding, Jersey Sweet, Perry Russet, Pewaukee, Rome Beauty, Stark, Summer Queen, Summer Pippin, and Wolf River.

Of these the Pewaukee, Stark, and Wolf River, have not been very generally tested; the Pewaukee and Stark have fruited in several localities, and the reports are generally favorable. Walbridge, Gideon, and Clayton are also new sorts, and although nothing can be stated with certainty, it would seem safe to try the Walbridge and Clayton in an experimental way, in all except the northern counties, while the Gideon, from its origin, should be as well adapted as any variety to the northern half of the southern peninsula.

It is hoped that some of the better of the Russian varieties will be found valuable for that section. We have about one hundred varieties here at the college, and a similar collection at Grayling, Crawford county, besides smaller numbers at various points in that section.

Upon the thin sand of the Jack pine plains they have grown for three years without injury either from the cold of winter, or the drought of summer. Some of those first planted at the college gave a few fruits in 1893, and among these the Charlottenthaler seems particularly valuable as an early summer variety. The tree is an early bearer; the fruit is large, light lemon yellow in color, and, although rather acid, it is of a pleasant flavor; it seems well worthy of a place in a collection intended for supplying fruit for a local market.

It should be stated that had the returns been accurately canvassed Fameuse would have been in the double star list, but its seedling Shiawassee has all of its good qualities and is, moreover, a better growing and more productive tree, and the fruit is but little injured from the scab which in some seasons nearly ruins the Fameuse. The growers familiar with both varieties in every case marked the Shiawassee with two and Fameuse with a single star. As the Shiawassee cannot always be obtained from nurseries, many planters will find the Fameuse useful to plant in its stead. (Among the nurserymen who have a stock of this valuable sort are Buttrick & Watterson, of Cascade, Mich.)

The Keswick seems to be quite a sure bearer, even in off years, and it is particularly valuable as a fall variety for cooking purposes, since it remains for a long time in season.

There is often a good local market for apples, and a collection suitable for that purpose may be desired by some planters. The varieties to be used should be selected with rather more regard to productiveness and high color than those designed for home use. Such varieties as Red Astrachan, Oldenburgh, Shiawassee, Twenty Ounce, Jonathan, Hubbardston, Baldwin, King, and Northern Spy, if planted in rather larger numbers than when intended for home consumption only, would furnish a supply for sale.

In planting an orchard to secure fruit for shipment it is unwise to

choose too many varieties and one should be guided largely in his selection by the kinds that succeed best in his locality.

They should be productive, of good size and color and of, at least, fair quality. In nearly all parts of the State, where they are sufficiently hardy, the Baldwin and Northern Spy are valuable for planting in commercial orchards, although the latter is a long time coming into bearing. The Ben Davis is also largely planted, although it, as grown here, is much inferior to the same variety grown in Missouri and Illinois. Hubbardston and Westfield are much prized for their quality. Red Canada is very popular as a market sort in the central and eastern part of the State, its productiveness, high color and good quality making it especially desirable. In the northern counties, especially along the west side of the State, Wagener is in high esteem. Farther south it is less valued, as, unless thinned and given high cultivation, the fruit is small and the trees short-lived from their tendency to overbear. Of the varieties for winter use, none are more profitable than Tompkins King, although with good care the Jonathan in many localities is preferred, as its medium size, rich color and high quality make it sought for as a dessert apple and for sale at street fruit stands. Grimes Golden is also profitable in nearly all parts of the State. In planting a commercial orchard one should select the two or three sorts that do best in his locality.

Of the new sorts that do not appear in the fruit list the Sutton is well worthy of trial. It has long been grown in Massachusetts under conditions much like those in this State and it is there highly valued as a variety for both home use and market on account of its hardiness, productiveness and the high color and quality of the fruit. Among the other varieties that are desirable from their behavior elsewhere are Princess Louise, Early Colton and Carlough (sweet).

CRAB APPLES.

While this fruit is commonly grown for home use and local market, the quantity shipped is comparatively small. Little attention has been paid to the introduction of new varieties and, of those given in the following list, the Whitney is the only one that has not been in general cultivation for many years. As will be seen from the list the Hyslop and Transcendent are best known. The Montreal Beauty and Whitney are also desirable sorts.

APPLES.—CRABS.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Hyslop	l	r	r	g	F M	A	Am.	**	**	**	**	**
Montreal Beauty	l	r ob	y r	g	F M	A	Am.	*	*	*	*	*
Red Siberian	m	r	r	g	F M	A	F.	-----	*?	*?	*?	*
Transcendent	l	r ob	y r	g	F M	A	Am.	**	*	**	**	**
Whitney	l	r fl	r	v g	M	S	Am.	*	*	-----	*	-----
Yellow Siberian	m	r	y	g	F M	A	F.	-----	-----	*	-----	*

APRICOTS AND NECTARINES.

In most parts of the State these fruits are not successfully grown as, if the blossoms escape the early spring frosts, the trees are short-lived. Along the west shore, however, and in favorable locations in Southern Michigan, fairly good results are obtained, particularly with apricots. The varieties mentioned in the list are among those best known, but for commercial planting it is probable that the apricot known as Harris, which is proving very profitable in New York will be preferable; the Acme is another sort that seems worthy of trial. From the behavior of the Russian apricots it is doubtful if any of them are desirable for planting.

APRICOTS.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. FORM—r, roundish; r f, roundish flattened; r o, roundish oval; ob c, oblong compressed. COLOR—y o, yellow, shaded to deep orange in the sun; o r, orange with red cheek; o, orange. QUALITY—g, good; v g, very good; b, best. USE—All apricots being valued for the dessert, the letter F will signify that it is extra for the dessert, and F M that it is valued for the dessert and at the same time profitable for market. SEASON—E, early; M; medium; L, late in season of ripening. ORIGIN—F, foreign; Am, American.

Names.	Description.							Value.			
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.
Breda	m	r	o	v g	F M	E	F.	*?	*?	*?	*?
Early Golden	s	r o	o	v g	F M	E	F.	*?	*?	*?	*?
Moorpark	l	r	y o	b	F M	L	F.	*?	*?	*?	*?

NECTARINES.

Names.	Description.							Value.			
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.
Boston	l	r o	o r	v g	F	M	Am.	*?	*?	*?	*?
Early Violet	l	r	o r	b	F	E	F.	*?	*?	*?	*?
Stanwick	l	r o	o r	g	F	L	F.	*?	*?	*?	*?

BLACKBERRIES.

As with many other fruits, the varieties of blackberries that are best in size and flavor are deficient in hardiness. Where this quality is necessary to a high degree, recourse to such sorts as Stone and Snyder will be necessary. In most parts of the State, however, the Taylor will succeed and will be found preferable to those sorts, so far as size is concerned. The Agawam is in every way a desirable sort except that it has strong curved spines, that render picking unpleasant. Erie, Kittatinny, Lawton, Wilson and Wilson Junior will be found excellent sorts where they have the necessary hardi-

ness. Although so deficient in hardiness as to require laying down in winter, the Early Harvest is very largely grown as a commercial variety in Berrien county, and its productiveness and earliness make it a very profitable sort.

BLACKBERRIES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. FORM—ob c, oblong conic; r c, roundish conical or oval; ob ov, oblong oval. COLOR—b, black. QUALITY—g, good; v. g., very good; b, best. USE—F M, family and market; M, market. SEASON—M, medium; E, early; L, late. ORIGIN—Am, American; F, foreign.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Agawam	l	ob ov	b	v g	F M	M	Am.	*	------	*?	*	------
Ancient Briton	l	ob ov	b	v g	F M	M	Am.	*	------	*?	*	------
Early Harvest	m	ov	b	g	F M	VE	Am.	*	------	*	*	------
Erie	l	ob ov	b	g	F M	M	Am.	*	*?	*?	*?	------
Kittatinny	l	r c	b	b	F M	M	Am.	*	*	*	*	------
Lawton	l	ov	b	g	M	L	Am.	*	*?	*?	*?	------
Lucretia	l	ob ov	b	v g	F M	VE	Am.	*	------	------	------	------
Minnewaski	l	ov	b	g	M	M	Am.	------	†	*?	*	------
Snyder	m	r ov	b	v g	F M	E	Am.	**	**	**	**	*
Stone (Hardy)	l	ob	b	g	F	------	Am.	*	*?	*?	*?	*
Taylor, *Taylor's Prolific*	l	ob ov	b	g	F M	M	Am.	**	*	**	**	*
Wachusett	m	ob ov	b	v g	F M	M	Am.	------	*?	*?	*?	------
Western Triumph	m	ob ov	b	g	F M	M	Am.	------	------	*	*	------
Wilson	l	ob ov	b	v g	M	E	Am.	*	*?	*	*?	------
Wilson Junior	l	ob ov	b	v g	M	E	Am.	*	*?	*	*?	------

CHERRIES.

As noted in the accompanying bulletin by Pres. Lyon the sweet cherries are, as a rule, short-lived in Michigan, although the method of training and handling them that he recommends will undoubtedly prolong their life. Black Tartarian, Gov. Wood, Yellow Spanish and Napoleon easily stand at the head of the list. Windsor is highly commended in some places but seems to be lacking in hardiness in others. Among the varieties in the Duke and Morello class, Early Richmond, May Duke, Large Montmorency and Morello seem most generally successful, although Late Duke, Royal Duke and Olivet thrive wherever they have been grown.

In localities where hardiness is desirable the Wragg, Ostheim and Brusseler seem worthy of trial. The Vilne Sweet has fruited this year and seems to be the equal of the Gov. Wood in every respect and is said to be much superior in hardiness.

For the most part the cherry is troubled by the same insects and diseases as the plum and the treatment recommended in Bulletins 103 and 104 will be found useful.

CHERRIES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. FORM—ob h, obtuse heart shape; r ob h, roundish obtuse heart shape; r h, roundish heart shape; r, roundish or round. COLOR—l r, lively bright red; d r, dark red, almost black; a m, amber mottled with red; y r, yellow ground shaded and marbled with red. USE—F, family, for dessert; F M, family or market; K M, for cooking or market; M, market. SEASON—E, early; M, medium; l, late. ORIGIN—F, foreign; Am., American.

Names.	Description.						Value.				
	Size.	Form.	Color.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Heart and Bigarreau Cherries—											
Bigarreau, *Yellow Spanish*	l	ob h	y r	F M	M	F.	*	*	*	*	------
Black Eagle	l	ob h	d r	F M	M	F.	*?	*?	*?	*?	------
Black Heart	l	r h	d r	F M	M	F.	*?	*?	*?	*?	------
Black Tartarian	l	r h	d r	F M	M	F.	**	**	**	**	------
Downer Late	m	r h	y r	F M	L	Am.	*	------	------	*?	------
Early Purple	m	r h	d r	F M	E	F.	*	*?	*?	*	------
Elton	l	r h	y r	F M	M	F.	*	*	*?	*?	------
Governor Wood	l	r h	y r	F M	M	Am.	**	**	**	**	------
Napoleon	l	r ob h	y r	F M	M	F.	*	*	*	*	------
Rockport	l	r ob h	a m	F M	E	Am.	*	*?	*?	*	------
Windsor	l	r h	d r	M	L	Am.	†	†	†	------	------
Duke and Morello Cherries—											
Carnation	m	r	a m	K M	L	F.	*?	------	*?	†	------
Early Richmond	s	r	l r	K M	E	F.	**	**	**	**	**
Eugenie *Empress Eugenie*	m	r ob h	d r	F M	M	F.	*	------	*?	*	------
Hortense	l	r	l r	F M	L	F.	*?	*	*?	*	------
Late Duke	l	ob h	d r	K M	L	------	*	*	*	*	------
Late Kentish	m	r	r	K	M	F.	*	------	*?	**	------
Louis Phillippe	l	r	d r	K M	L	F.	*	*?	------	*	------
Magnifique	l	r h	l r	K M	L	F.	*	*	*?	*	------
May Duke	l	r ob h	d r	K M	E	F.	**	**	**	**	*
Montmorency, Large	l	r	d r	K M	M	F.	**	*	*	**	------
Morello, *English Morello*	l	r h	d r	K M	L	F.	**	**	**	**	**
Olivet	l	r	r	F	M	F.	------	*?	*?	*	------
Royal Duke	l	r	d r	K M	M	F.	*	*	*	*	------

CURRANTS.

The notes upon these fruits in the South Haven report are very complete and little more need be said. Although the Cherry, Fay and Versaillaise produce much larger fruit than the Red Dutch, Victoria and Prince Albert, they are so infested with borers that the latter will be found much more reliable. The Prince Albert in particular should be commended as it is but little troubled by currant worms, and carries its fruit until all other varieties are gone.

CURRANTS.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. FORM—with reference to form of bunch—l, long; v l, very long; s, short; m, medium. COLOR—r, red; b, black; w, white. QUALITY—a, acid; m a, moderately acid; v a, very acid. USE—K M, kitchen and market; F M, family and market; M, market. SEASON—E, early; M, medium; L, late. ORIGIN—Am, American; F, foreign.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Black Naples	l	s	b	m a	K M	M	F.	*	*	*	*	*
Cherry	l	s	r	v a	M	M	F.	*	*	*	*	*
Fay	l	l	r	m a	F M	M	Am.	*	*	*	*	*
Lee	l	l	b	m a	F M	M	F.	*	*	*	*	*
Prince Albert	l	l	r	m a	M	L	F.	*	*	*	*	*
Red Dutch	m	m	r	m a	F M	E	F.	**	**	**	**	**
Versaillaise	l	s	r	a	M	M	F.	*	*	*	*	*
Victoria, *Raby Castle*	l	v l	r	a	F M	L	F.	**	**	**	**	**
White Dutch	m	l	w	m a	F M	E	F.	**	**	**	**	**
White Grape	m	l	w	m a	F M	E	F.	*	*	*	*	*

GOOSEBERRIES.

The Downing is as yet the variety for market, although Smith, Houghton and Pale Red are largely grown. The Industry has been extensively advertised and quite generally planted, but except in a very few localities it has been a failure. The plant is a poor grower except in cool, moist soils, and the leaves and fruits are much injured by mildew. The use of fungicides will suffice to hold this disease in check. Red Jacket is the most promising of the new sorts.

GOOSEBERRIES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. FORM—r, round; o, oval; r o, roundish oval. COLOR—r, reddish, when fully ripe; g, greenish yellow, when fully ripe. QUALITY—g, good; v g, very good; b, best. USE—K, Kitchen; M, market. SEASON—E, early; M, medium; M L, medium late. ORIGIN—Am, American; F, Foreign.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Downing	m	r o	g	v g	K	M L	Am.	**	**	**	**	**
Houghton	s	r o	r	g	K M	E	Am.	*	*	*	*	*
Industry	l	r o	r	v g	K	M	F.	*?	*?	*?	*?	*?
Smith, *Smith's Improved*	l	o	g	v g	K M	M	Am.	*	*	*	*	*

GRAPES.

Not less than fifty varieties of this fruit are brought out each year, and the list has become so loaded down that many of the best varieties are buried out of sight. Worden and Concord are still our best black grapes

and Delaware leads the list of the reds, followed closely by Salem, one of the Rogers' hybrids. In some sections, however, the Brighton is preferable to either of these sorts, but, in many localities, it is so subject to mildew that it is not held in high esteem. Of the white varieties, the Niagara stands at the head of the list. Although, not universally successful, it is very productive in the grape-growing districts, and the large size of the bunches and the quality of the fruit make it readily salable at a remunerative price. Winchell (Green Mountain) of the new grapes is certainly an acquisition as an early white variety, while Colerain is very promising.

GRAPES.

ABBREVIATIONS.—SIZE—with reference to the berry; l, large; m, medium; s, small. FORM—with reference to the bunch and berry; s r, short bunch, round berry; l r, large and round; m r o, medium bunch, roundish oval berry; m r, medium bunch, round berry. COLOR—b, black, or nearly so when fully ripe; r, reddish or copper-brownish red; g, greenish white or yellowish. QUALITY—g, good; v g, very good; b, best. USE—T, table; M, market; W, wine. SEASON—E, early; M, medium; L, late. ORIGIN—The species to which each variety belongs is designed as follows: Lab., *Labrusca;* Æst., *æstivalis;* Rip., *riparia;* Vulp., *vulpina.* An x after one of the species denotes a cross with a variety of some other species. Hyb., hybrid, between a foreign variety and one of the native species.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Agawam	l	s r o	r	g	T M	M	Hyb.	*	*	*	*	------
Barry	l	r	b	g	T M	M	Hyb.	*	------	------	*	------
Brighton	l	r	d p	v g	T	E	Hyb.	*	*	**	**	------
Catawba	l	m r o	r	b	TMW	L	Lab.	*?	*?	*?	*?	------
Concord	l	l r	b	g	TMW	M	Lab.	**	**	**	**	**
Delaware	s	s r	r	b	TMW	M	x?	**	**	**	**	**
Diana	m	s r o	r	v g	T M	L	Lab.	*	*?	*?	*?	------
Empire State	s	r	w	v g	T M	M	Hyb.	*	*?	*	*	------
Eumelan	m	r	b	v g	T	M	Lab.	*?	*?	*?	*?	------
Goethe	l	l r o	g	v g	T W	L	Hyb.	*?	------	*?	------	------
Hartford (*Prolific*)	l	m r o	b	g	M	E	Lab.	*?	*?	*?	*?	*
Hayes	m	s r	w	v g	T	M	Lab.	*?	------	------	------	------
Herbert	l	l r	b	v g	T M	M	Hyb.	*?	------	*?	*?	------
Iona	m	m r o	r	b	TMW	L	Lab.	*?	------	*?	*?	------
Ives	m	m r o	b	g	M W	M	Lab.	*?	*?	------	*?	------
Jefferson	m	m r	r	v g	T M	M	Hyb.	*?	------	*?	*?	------
Lady	l	r	w	g	T M	E	Lab.	*	------	*	*	------
Lindley	m	m r o	r	g	T M	M	Hyb.	**	*	*	*	------
Massasoit	l	m r	r	g	T M	M	Hyb.	*	*?	------	*	------
Merrimac	l	s r	b	g	M	M	Hyb.	*	------	*	------	------
Moore Early	l	r	b	g	T M	V E	Lab.	*	*	**	**	**
Niagara	l	r	w	g	T M	M	Lab.	**	*	**	**	**
Pocklington	l	l r	w	g	T M	M	Lab.	*	------	*	*	------
Prentiss	m	m r	w	v g	T M	M	Lab.	*	------	------	*	------
Salem	l	r	b	g	M	M	Hyb.	**	*	**	**	------
Vergennes	s	l r	p	v g	T M	E	Lab.	*	*	*	*	------
Wilder	l	l r	b	v g	T M	M	Hyb.	*	*?	*?	*	------
Worden	l	r	b	g	T M	E	Lab.	**	**	**	**	**
Woodruff	l	m r	r	g	M	M	Hyb.	*	------	*	*	------
Wyoming	m	m r	r	g	M	M	Lab.	*	------	*	*	------

While the above varieties are sufficient to cover the season of ripening and embrace the leading commercial sorts, some growers may wish for a somewhat longer list, and for them the following additional kinds would be desirable: Agawam, Barry, Empire State, Lady, Lindley, Massasoit,

Merrimac, Moore Early, Pocklington, Vergennes, Wilder, Woodruff and Wyoming. Hartford and Ives are sometimes of value. The other varieties in the list have been given *? in nearly every section and, while several of them, as Catawba, are among our best grapes where they thrive, they succeed in very few sections of Michigan. For notes upon these and many other sorts, reference is given to our South Haven Bulletin.

PEACHES.

In the peach list, the varieties with two stars will make up a good collection for market purposes and the addition of a few sorts of rather higher flavor from the single star group, such as Mountain Rose and Oldmixon, will give one as good as can be selected for home use. As this fruit has been treated at length in Bulletins 103 and 104 nothing more need be said here.

PEACHES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. CLASS—F, freestone; C, clingstone. COLOR—relative to the flesh, w, white or pale color; y, yellow or yellowish; g, greenish white, red at stone. QUALITY—j v, juicy vinous; m j r, melting, juicy, rich; s j, sweet, juicy; s j h, sweet, juicy and high flavored. GLANDS—s, serrated, without glands; g, glands, globose; r, glands, reniform. SEASON—E, early; M, medium; L, late; V E, very early; V L, very late. ORIGIN—Am, American; F, foreign.

Names.	Description.							Value.			
	Size.	Class.	Color.	Quality.	Glands.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.
Alexander	m	F	w	s j	g	V E	Am.	*?	*	*	*
Barnard	m	F	y	j v	g	E		**	**	**	**
Beer Smock	l	F	y	j v		L	Am.	*	*	*	*
Bronson	m	F	y	j v		L	Am.	**	**	**	**
Crawford Early	l	F	y	j v	g	M	Am.	*	*?	*	*
Crawford Late	l	F	y	j v	g	L	Am.	*	*?	*	*
Early Michigan	m	F	wr	j v		E	Am.	**	**	**	**
Elberta	l	F	y	m j r		M	Am.	*	*	*	*
Engle Mammoth	l	F	y	m j	g	M	Am.	**	**	**	**
Foster	l	F	y	j v	g	L	Am.	*	*?	*?	*?
George IV	m	F	y	m j r	g	M	Am.	*?		*?	*?
Gold Drop	m	F	y	j v	r	V L	Am.	**	**	**	**
Hale	m	F	w	m j r	g	V E	Am.	**	**	**	**
Hill Chili	m	F	y	j r		L	Am.	**	*	**	**
Kalamazoo	m	F	y	m j r		L	Am.	**	**	**	**
Large Barnard	l	F	yr	j r		M	Am.	*	**	*	*
Large Early York	m	F	w	s j h	g	V E	Am.	*	*	*	*
Lewis	m	F	w	m j r	g	E	Am.	**	**	**	**
Mountain Rose	m	F	w	s j	g	M	Am.	*	*	*	*
Oldmixon Free	l	F	g	s j h	g	M	Am.	*	**	**	**
Oldmixon Cling	l	C	w	m j r	g	M	Am.	*	*	*	*
Red Cheek Melocoton	l	F	y	j v	g	M	Am.	*	*	*	*
Richmond	m	F	w	m j	r	M	Am.	*	*	*	*
Rivers (*Early Rivers*)	l	F	py	m r	r	E	Eng.	*	*	*	*
Saint John	l	F	y	s j	g	V E	Am.	*	*	*	*
Salway	l	F	yr	m j	r	M	Am.	*	*?	*	*?
Smock	l	F	y	j v	r	L	Am.	**	**	**	**
Snow's Orange	m	F	y	m j	r	M	Am.	**	**	**	**
Stump the World	l	F	w	s j h	g	L	Am.	*	*	**	**
Susquehanna	l	F	y	s j v	g	M	Am.	*		*?	*?
Yellow Rareripe	l	F	y	j v	g	E	Am.	*	*	*	*

PEARS.

While many commercial pear growers make a specialty of some one variety that seems particularly suited to their soil or method of handling it, others select such sorts as will give them a succession throughout the season and as a rule they will be about the same as would be planted for family use. Pear trees are known as standards or dwarfs, the difference being due to the kind of roots upon which they have been worked; in one case they are budded upon seedling pear stocks while, in the other, quince stocks have been used. Dwarfs are seldom used in commercial orchards although if the branches are cut in annually, so that they will correspond with the area of the roots, and the trees are given plenty of plant food and thorough cultivation they will be found quite profitable.

Reference to the "value" column of the pear list will show that the Bartlett and Anjou stand high in the estimation of fruit growers, both of them receiving double stars in every section of the state. The first is a well-known sort that succeeds everywhere but the other is not so well-known. It grows and fruits well, both as a standard and a dwarf, and is one of the most valuable sorts both for home use and market.

The varieties that come next in general favor are Bosc, Clapp Favorite, Flemish Beauty, Howell, Seckel and Sheldon. The Bosc stands very close to the Anjou as a variety for either home use or market; coming between that variety and Bartlett it is well worthy of a place upon every list. Clapp Favorite is liable to rot at the core unless it is picked early and ripened in a warm room; while a productive variety, it is not as valuable as the kinds above mentioned, and although a few trees may be desirable it is not worthy of extensive planting. Flemish Beauty succeeds well in some localities and contests with the Bartlett for supremacy in its season. In other sections it is so subject to scab and cracking that it is not appreciated. With a proper use of Bordeaux mixture, fairly good results can be obtained with this sort in nearly all localities.

The Howell is one of the most desirable of autumn pears for market, in particular, and is worthy of a place upon the list for home use. The Seckel and Sheldon are well known and valuable varieties, but they require (the Seckel particularly) thorough cultivation and high manuring if large, perfect fruits are to be obtained. Onondaga in some respects resembles Bartlett, but it is later and a good market sort. Lawrence follows Anjou and is excellent for early winter use.

Of the varieties particularly desirable for market sorts are Keiffer and Clairgeau. In the southern part of the state these vatieties, when well ripened, have a ready sale for cooking purposes and have been found quite profitable.

The Angouleme (Duchess) has quite generally been given two stars and when grown as a dwarf it is certainly worth planting as the fruit is large, of fair quality, and produces in abundance. The Louise Bonne is another sort that should always be grown as a dwarf, while Anjou, Bosc, Howell and Seckel do well that way.

Of the other varieties that are worth a place in the list, Boussock, Buffum, Josephine of Malines, Lawrence, Lucrative, Madeleine, Onondaga, Osband, Sterling, Stevens Genesee, Sumner Doyenne, Tyson, Vicar and Winter Nelis are most valuable. As a list that gives a succession through the season the following is submitted: Sumner Doyenne, Sterling, Clapp

Favorite, Bartlett, Howell, Onondaga, Bosc, Sheldon, Anjou and Lawrence.

Of the varieties of pears recently placed upon the market, the best known are Idaho, Wilder and Vermont Beauty. While they have not been sufficiently tested in Michigan to warrant an opinion of their value, it may be well to state that the Idaho is almost identical with Sheldon, while the other two resemble Seckel, the former being earlier and the latter later than that variety.

PEARS.

ABBREVIATIONS.—SIZE—s, small; l, large; m, medium. FORM—p, pyriform; r o p, roundish obtuse pyriform; r a p, roundish acute pyriform; ob p, obtuse pyriform; ob o p, oblong obtuse pyriform; r, roundish; r ob, roundish obtuse. COLOR—y g, yellow or yellowish green with a red or russet red cheek; y r, yellow and russet; y, when mostly yellow or yellowish. QUALITY—g, good; v g, very good; b, best. USE—F, valuable family dessert; K M, kitchen and market; F M, family and market. SEASON—S, summer; L S, late summer; A, autumn; E A, early autumn; L A, late autumn; W, Winter. ORIGIN—Eng., English; Am., American; F, French; Fl, Flemish; B, Belgium; H, Holland.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Angouleme (*Duchess*)	l	ob o p	y	v g	F M	A	F.	**	*	**	**	**
Anjou, *Buerre d' Anjou*	l	ob p	y g	v g	F M	L A	F.	**	**	**	**	**
Bartlett	l	ob o p	y	v g	F M	L S	Eng.	**	**	**	**	**
Bloodgood	m	r	y r	v g	F	S	Am.	*	*?	*?	*?	------
Bosc, *Beurre Bosc*	l	p	y r	b	F M	L A	B.	*	*	**	**	------
Bonssock	l	r o p	y r	v g	F M	E A	B.	*	*	*	*	------
Brandywine	m	r ob	y g	v g	F M	S	Am.	*?	------	------	*	*
Buffum	m	r o p	y g	g	M	E A	Am.	*	*	*	*	------
Clairgeau	l	p	y r	g	M	L A	F.	*	*	*	**	*
Clapp Favorite	l	ob o p	y g	v g	F M	S	Am.	*	*	*	**	**
Dana Hovey	s	r ob p	y g	b	F	W	Am.	*	------	*	------	------
Diel	l	r ob p	y r	v g	F M	L A	B.	*	------	------	*?	------
Easter Beurre	l	r ob p	y r	v g	F	W	B.	*?	------	------	*	------
Flemish Beauty	m	r ob p	y g	v g	F M	E A	B.	*	*	**	**	*
Giffard	l	p	y g	v g	F M	S	F.	*?	------	*?	*?	------
Glout Morceau	l	ob p	y	g	F	L A	F.	------	------	*?	*?	------
Gray Doyenne	m	r	y r	b	F M	L A	F.	------	------	*?	*?	------
Hardy, *Beurre Hardy*	l	ob p	y g	v g	F M	E A	------	*?	*?	*?	*?	------
Howell	l	r p	y g	v g	F M	E A	Am.	*	*	*	*	------
Josephine of Malines	m	r ob p	y r	v g	F M	W	F.	*	*	*	*	------
Kieffer	l	r o p	y r	g	K M	A	Am.	*	*	*	*	------
Lawrence	m	r o p	y r	v g	F M	W	Am.	*	*	*	*	------
Louise Bonne of Jersey	l	ob p	y g	v g	F M	E A	F.	*	*	*	*	*
Lucrative	m	ob r	g y	b	F	E A	Fl.	*	*	*	*	------
Madeline	m	p	y g	v g	F M	S	F.	*	------	*	*	------
Manning Elizabeth	s	ob p	y r	v g	F	S	------	*?	------	*?	*?	------
Mount Vernon	m	r o p	y r	v g	F M	L A	Am.	*?	*?	*?	*?	------
Onondaga, *Swan's Orange*	l	ob p	y g	v g	F M	L A	Am.	*	*	*	*	------
Osband Summer	s	r p	y g	v g	F	S	Am.	*	*,	*	*	------
Pound	l	p	y	g	K M	W	------	------	*	------	*	*
Rostiezer	s	p	y g	b	F	S	------	*?	*?	*?	*?	------
Seckel	s	r	y g	b	F M	A	Am.	*	*	**	**	*
Sheldon	m	r	y g	v g	F M	A	Am.	*	*	**	**	*
Souvenir du Congress	l	p y r	y g	v g	F M	S	F.	------	------	*	*	------
Sterling	m	r	y g	v g	F M	E A	Am.	*	*	*	*	------
Stevens Genesee	l	r	y	v g	F M	E A	Am.	*	*	*	*	------
Summer Doyenne	s	r o p	y g	v g	F	S	B.	*	*	*	*	*
Superfin, *Beurre Superfin*	m	r p	y r	v g	F	A	F.	------	*?	*?	*?	------
Tyson	m	r a p	y g	b	F	S	Am.	*	*?	*	*	------
Vicar, *Vicar of Winkfield*	l	p	y	g	K M	W	F.	*	*	*	*	------
White Doyenne. *Virgalieu*	m	ob p	y g	b	F M	A	F.	*?	*?	*?	*?	*
Winter Nelis	m	ob p	y r	b	F M	W	B.	*	*	*	*	*

PLUMS.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small. FORM—o, oval; ob, obovate; r, roundish. COLOR—g, greenish; p, purplish; r, reddish; y, yellow. QUALITY—b, best; g, good; v, very. USE—F, family; M, market. SEASON—E, early; L, Late; M, medium. ORIGIN—Am, American; F, Foreign.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
European—												
Bavay, *Bavay's Green Gage*	l	r	g y	b	F	L	F.	*	*	*	*	------
Bradshaw	l	o ob	r p	g	M	M	Am.	**	**	**	**	**
Coe Golden Drop	l	o	y r	v g	F M	L	F.	**	**	**	**	**
Field	l	r o	r p	g	M	E	Am.	†	†	†	†	------
Copper	m	o	p	g	F M	M	F.	†	†	†	†	------
Damson	s	o	p	g	M	L	Am.	*	**	*	*	*
Duane Purple	l	o	r p	g	F M	E	Am.	*	*	*	*	------
German Prune	l	o	p	g	F M	M	F.	*	*	**	*	*
Grand Duke	l	r o	p	v g	F M	L	F.	†	†	†	†	------
Green Gage	s	r	g y	b	F	M	F.	*	*?	*	*	*
Imperial Gage	m	o	g y	b	F M	M	Am.	*	*	*	*	------
Italian Prune, *Fellemburg*	m	o	p	g	F M	M	F.	*	*	*	*	------
Jefferson	l	o	y r	b	F M	M	Am.	*?	*?	*?	*?	------
Lombard	m	r o	r p	g	M	M	Am.	**	**	**	**	**
MacLaughlin	l	r	y r	b	F M	M	Am.	*	------	*	------	------
Moore Arctic	m	r o	p	g	F M	M	Am.	------	*	*?	*	*
Pond (English)	l	o	y r	g	M	M	F.	*	**	**	**	**
Prince Englebert	l	o	p	v g	F M	M	F.	------	**	*	**	*
Quackenboss	l	r	p	g	M	M	Am.	*	**	*	**	*
Shropshire Damson	s	o	p	g	F M	L	Eng.	*	**	**	*	**
Smith Orleans	l	o	r p	v g	F M	M	Am.	*	*	*	*	------
Stanton	m	r o	d p	v g	F M	L	Am.	†	†	†	†	------
Washington	l	r o	g y	v g	F M	M	Am.	*	*	*	**	**
Yellow Egg	l	o	y	g	F M	M	------	*	*	*	*	*
Japanese—												
Abundance (*Sweet Botan*)	m	r o	p	g	F M	M	Jap.	*	*	*	*	*
Botan (*White*)	m	r o	r p	g	F M	M	Jap.	------	*?	*?	*?	------
Burbank	m	r	p	g	F M	M	Jap.	†	†	†	†	------

For extended notes upon the varieties of plums reference is made to Bulletin 103.

QUINCES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small; v, very. FORM—o, oblate; ob, obtuse; p, pyriform; r, roundish. COLOR—g, greenish; y, yellow. QUALITY—H, half tender; T, tender. USE—F, kitchen; M, market. SEASON—E, early; L, late. ORIGIN—Am, American; F, foreign.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Apple or Orange	l	r	y	h t	M K	E L	------	**	*	**	**	------
Champion	v l	ob p	y	t	M K	L	Am.	*	*	*	*?	------
Meech	l	r ob	y	t	M K	M	Am.	†	†	†	†	------
Rea	l	r ob	y	h t	M K	E	Am.	------	*	*	*	------

RASPBERRIES.

The varieties of Sub-section 1 are not used for market purposes, but on account of their superior flavor they are valued for home consumption in the southern part of the State.

Of those in Sub-section 2, Shaffer seems to be the only one that is favored. The berries are large and are produced abundantly, but their dull color and peculiar flavor are against them. In Sub-section 3, Palmer seems to be the favorite for early, and Gregg for late, although Conrath, Ohio and Souhegan had many votes. The Hansell and Marlboro seem to be well liked as early red sorts, and Cuthbert is universally favored for late. Turner is liked in the northern section because of its superior hardiness. Crimson Beauty seems also to succeed in some localities if planted with other kinds that can fertilize it.

RASPBERRIES.

ABBREVIATIONS.—SIZE—l, large; m, medium; s, small; v, very. FORM—c, conical; o, obtuse; r, roundish. COLOR—b, black; p, purplish; r, reddish; y, yellow. QUALITY—b, best; g, good; v, very. USE—M, market; F, family. SEASON—E, early; L, late; M, medium. ORIGIN—Am, American; F, foreign.

Names.	Description.							Value.				
	Size.	Form.	Color.	Quality.	Use.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Sub-section 1.—R. Idaeus—												
Clarke	m	r	r	g	F M	E	Am.	*	*?	*?	------	------
Herstine	l	ob c	r	v g	F M	M	Am.	*	------	*?	*?	------
Hudson River Antwerp	l	c	r	b	F M	M	Am.	*	------	*?	*?	------
Orange, *Brinckles*	l	c	y	b	F	M	Am.	*	------	*?	*?	------
Sub-section 2.—R. neglectus—												
Caroline	m	ro	y	g	F	M	Am.	*	------	*	*	------
Philadelphia	m	r	p	g	M	M	Am.	*	------	*	*	------
Purple Cane	m	r	p	g	M	M	Am.	*?	------	*	*	------
Shaffer	v l	r	p	g	F M	M	Am.	**	**	**	**	*
Sub-section 3.-R. occidentalis—												
Conrath	m	r	b	g	F M	E	Am.	*	*	**	**	------
Doolittle	s	r	b	g	M	M	Am.	*	*	*	*	------
Gregg	v l	r	b	g	F M	M	Am.	**	**	**	**	*
Hilborn	v l	r	b	g	F M	M	Am.	*	*	*?	*	------
Johnston Sweet	m	r	b	v g	F M	M	Am.	*	*	*?	*	------
MacCormick, *Mam. Cluster*	m	ob c	b	v g	F M	L	Am.	*	*	*	*	------
Nemaha	l	r	b	g	F M	M	Am.	*	*	*	*	*
Ohio	m	r	b	g	F M	M	Am.	*	*	**	**	*
Palmer	m	r	b	g	F M	E	Am.	**	**	**	**	*
Souhegan, *Tyler*	m	r	b	g	F	E	Am.	*	*	*	*	*
Sub-section 4.—R. strigosus—												
Brandywine	m	r c	r	g	F M	M	Am.	*	------	*	------	------
Cuthbert	l	r o	r	g	F M	M	Am.	**	**	**	**	**
Golden Queen	l	r c	y	v g	F M	M	Am.	*	*	*	*	------
Hansell	m	r c	r	v g	F M	V E	Am.	*	------	*	*	------
Marlboro	l	r c	r	g	F M	M	Am.	*	*	*?	*	*
Turner	m	r	r	g	F M	E	Am.	*	------	*	**	*

STRAWBERRIES.

The new strawberries do not seem to have met with much favor, as there were very few votes for kinds that have been introduced less than ten years. In addition to those mentioned in the list there were a few votes for Enhance, Greenville, Beverly, Marshall, Shuckless and Timbrell, but

it is not likely that the last three had been thoroughly tested. All of them are probably valuable sorts, if we can judge from their behavior elsewhere.

For notes upon other new sorts of raspberries and strawberries, the reader is referred to Bulletins 104 and 106.

STRAWBERRIES.

ABBREVIATIONS.—SIZE—l, large; s, small; m, medium. SEX—B, bisexual; P, pistillate; P B, nearly pestil; late. COLOR—d c, deep crimson; d s, deep scarlet; b. s, bright scarlet; w t, whitish tinted with red; l c light crimson. FORM—r c, roundish conical; o c, obtuse conical or coxcomb form; c, conical; r, roundish; r o c, roundish obtuse conical. FLESH—s, soft; f, firm; m, medium. SEASON—Early; M, medium-L, late; E L, early to late. ORIGIN—Am, American; F, foreign.

Names.	Description.							Value.				
	Size.	Sex.	Color.	Form.	Flesh.	Season.	Origin.	Southern Lake Shore.	Northern Lake Shore.	Southern Michigan.	Central Michigan.	Northern Michigan.
Bidwell	v l	B	b s	c	f	M	Am.	*		*?	*?	
Bubach No. 5	l	P	d r	r c	m	M	Am.	**	*	**	**	**
Captain Jack	l	B	d r	r c	f	L	Am.			*	*	
Charles Downing	l	B	d s	c	f	M	Am.	*?			*?	*?
Crawford	l	B	b c	o c	m	M	O.	*			*	
Crescent	l	P	b s	r c	m	M	Am.	**	*	**	**	**
Cumberland	l	B	b s	r c	s	M	Am.	*	**	*	**	*
Eureka	l	P	b r	r	m	M	O.	*	*?	*	*	*
Gandy	m	B	b r	c	f	L	Am.	*?	*	*	**	**
Haverland	l	P	r sc	o c	m	M	Am.	**	*	*	**	**
Jersey Queen	v l	P	b s	r c	f	L	Am.	*?	*?	*?	*?	
Jessie	v l	B	b s	r c	m	M	Am.	*	*?	*?	*?	*
Kentucky	l	B	b s	r c	f	L	Am.	*	*?	*?	*	
Manchester	l	P	s	o c	f	M	Am.	*?	*	*?	*	*
Miner	v l	B	c	r c	m	M	Am.	*	*	*	**	*
Mount Vernon	l	B	l s	r o c	m	L	Am.	*	*	*	*	*
Mrs. Cleveland	l	P	b c	r c	m	M	O.	*	*	*	*	*
Parker Earle	l	B	b r	l c	f	M	Tex.	**	**	*	**	*
Pearl	m	B	b r	o c	f	M	Am.	*	*	*	*	
Sharpless	v l	B	b r	o c	f	M	Am.	*	*	*	**	*
Warfield	m	P	d r	c	f	M	Ill.	**	*	**	**	*
Wilson	l	B	d c	r c	f	E M	Am.	**	**	**	**	*

In the above lists, the data regarding the size, shape, color, season and quality of the different varieties, etc., have been taken from the last report of the American Pomological Society, and the starring will be used in making up the Michigan Fruit List for the next volume, soon to be issued.

In the preparation of this catalogue, great assistance has been afforded me by the many persons who filled out and returned the circulars that were sent out. In most cases it was done so thoroughly and in such an intelligent manner that the returns were incorporated into this bulletin with a very few slight changes.

To all persons who aided in the preparation of this fruit list, the thanks of the collator are extended, for the help that was rendered and the many useful suggestions that were made.

While it is undoubtedly faulty in many particulars, it is sent out with the hope that it will be of value to prospective planters of fruit trees and plants.

AGRICULTURAL COLLEGE,
February 1, 1894.

STRAWBERRIES AND RASPBERRIES.

BY L. R. TAFT AND H. P. GLADDEN.

The variety tests of the above fruits have been quite successful the past season, and we trust the results will be found useful. The soil upon which they have been grown is of a sandy nature, but it contains a considerable amount of clay; before the plants were set, it was well enriched with stable manure and the raspberries were mulched with that material the winter after setting. A mulch of straw and marsh hay was given the strawberries late in the fall of 1892 and, just as growth was starting in the spring, it was removed, to admit of the cultivating and loosening of the soil between the rows, and was then replaced to act as a mulch and keep the berries clean. The strawberries from which the notes were taken were set in the spring of 1892, although we had another plantation, of most of the older sorts made in 1891, which we used for comparison. The raspberries were for the most part set in 1890 and 1891; a few, however, of the newer sorts were not obtained until 1892.

The season was very favorable for the strawberry crop, although it was somewhat cut short by leaf blight and hot weather; the raspberries were considerably injured by the winter and the crop of berries was lessened by the hot, dry weather of July.

The data for the tables were obtained by, or under the direction of Mr. Gladden, and many of the notes were prepared by him.

STRAWBERRIES.

In August a bulletin was issued containing the notes on eighty new varieties, that fruited for the first time the past season. In the table below, the varieties marked with an asterisk (*), are those described in that bulletin, and any one wishing for a further description of those sorts, except the few that are here given, is referred to Bulletin No. 100.

TABLE No. 1.—STRAWBERRIES.

ABBREVIATIONS.

Form.
b, broad. l, long.
c, conical. o, oval.
d, depressed. r, round.
i, irregular.

Size.
s, small.
m, medium.
l, large.

Color.
b, bright. l, light.
c, crimson. r, red.
d, dark. s, scarlet.

Variety.	Sex.	Vigor (1-10).	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness (1-10).	Size.	Form.	Color.	Quality.	Firmness.
*Accomack	b	6	May 24	June 21	June 30	6	m	l c	d c	9	7
*Afton	p	8	" 25	" 19	July 10	9.5	m to l	r c	d c	9	8.5
*Alabama	b	7	" 30	" 19	June 30	5	m	r c	d c	9	9.5
Alpha	b	6	" 25	" 21	July 5	8.5	m	c	l c	8	6
Arlington	p	8.5	" 24	" 16	" 10	9	m	r c	s	8	8
Auburn	p	9.8	" 29	" 21	" 10	8	m	o c	l c	9	8
Banquet	p	8	" 24	" 19	" 5	7	m	c	d c	9.5	6
*Beauty	b	8.5	" 24	" 21	" 10	9.5	l	r b c	b d s	8.5	6
Beder Wood	b	9	" 24	" 17	June 30	9	s to m	r	l c	7	8
Belle	b	8.5	" 25	" 23	July 9	9	m to l	l c	b s	8	9
*Belle of Lacrosse	p	8.5	" 25	" 21	" 9	9.5	l	r b c	b d s	8	8
*Beverly	b	9	" 25	" 21	" 10	8.5	l	r c	d c	9.5	9.5
*Bickle	p	8.5	" 24	" 19	----------	8.5	s to m	r c	l s	7	7
Boynton	p	9.5	" 24	" 19	July 5	9	s to m	o	l c	8	8
*Brunette	b	9	" 29	" 22	" 10	8	l	r c	v d c	9.5	9
Bubach	p	9.5	" 30	" 19	" 10	8.5	l	d c	l c	9	8
*California	b	7	" 29	" 26	" 10	4	s to m	l c	b d s	9.5	9
*Cameronian	b	9.5	" 29	" 25	" 8	8	m	r c	l s	7	7
*Cheyenne	p	8	" 25	" 21	" 10	7	m	l c	b s	9.8	9
*Clark Early	b	9.2	" 29	" 19	" 10	8.5	m to l	r o	d c	9.8	9
Clark Seedling	b	8.5	" 25	" 22	June 30	3	m to l	r c	d c	9.5	9
*Clyde	b	9.8	" 24	" 21	July 8	9.8	l to m	r c	b d s	8.5	9.2
Crawford	b	9	" 30	" 22	" 9	9	m	r c	s	9	9
Crescent	p	9.4	" 23	" 18	" 5	9.5	m	r c	s	7	8
Daisy	b	8.5	" 26	" 20	" 5	8.5	m	r c	l s	8	7
*Dayton	b	9	" 24	" 21	June 30	3	s	l c	------	9	8
Dew	b	9.4	" 31	" 26	July 6	7	l	i	d c	8	9
*Dutter	b	9	" 25	" 21	" 5	7.5	l	l c	b s	9	8.5
Eclipse	p	9.5	" 25,	" 20	" 10	8.5	s to m	o	l c	8	8
Edgar Queen	b	9.2	" 25	" 21	" 10	9	m to l	i r c	l c	7	8
Enhance	b	9.5	" 24	" 21	" 9	9	m to l	i r c	d c	8	9.5
*E. P. Roe	b	6	" 24	" 26	" 7	5	l	b c	s	8.5	8
Eureka	p	9.3	" 27	" 23	" 5	8	m	r c	d c	7	8
*Fairmount	b	9	" 25	" 19	" 9	9.5	l	d c	d c	9	7.5
Gandy	b	9.5	" 31	" 26	" 10	8	m to l	r b c	l c	9	8
Gen. Putnam	p	9.5	" 24	" 17	" 6	9	m to l	r	l s	8	8
*Glenfield	b	9.2	" 24	" 21	" 10	5	m	l c	d c	9	7
Great Pacific	p	9.5	" 25	" 21	" 5	9.5	m	d c	r	9	8
*Greenville	p	9.2	" 29	" 22	" 10	9.5	l	r d c	b c	8	7
*Gypsy	p	9.3	" 24	" 21	" 10	9	m	r c	d c	9	9
*Harmon	b	9	" 24	" 19	June 30	4	l	r c	v d c	9	9
*Hattie Jones	p	9.4	" 26	" 21	July 8	9.5	m to l	r d c	l s c	6	7
Haverland	p	9	" 24	" 21	" 5	9	m	l c	s	8	8
*Hermit	b	9	" 24	" 21	" 10	8	l	r c	b c	8	8
Hoard	b	8.5	" 25	" 22	" 9	9	m to l	r c	l c	8	8
*Huntsman	p b	9.8	" 29	" 21	" 10	8.5	l	r c	d c	9	8
*Hyslop	b	8	" 25	" 21	June 29	------	s	i	------	------	------
*Iowa Beauty	b	8	" 25	" 21	July 5	7	l	r c	b c	10	8.5
Jessie	b	8.5	" 24	" 19	" 6	8	m to l	r c	d c	7	9
*Jones Seedling	b	8.8	" 25	" 21	" 7	8.5	l	d c	d c	9	8.5
*Katie	b	9.4	" 29	" 21	" 10	7	l	r d c	c	8.5	7.5
King No. 2	b	9	" 26	" 20	" 5	7	m	r c	l c	8	8
*Leader	b	8.6	" 24	" 21	" 9	8.5	l	l c	b d c	9.5	9
*Leroy	p	9.4	" 24	" 18	" 5	9	l	d c	d c	8.5	8
*Leviathan	b	7.5	" 28	" 21	" 10	8.5	l	b d	l s	6	5

TABLE No. 1.—STRAWBERRIES.—CONTINUED.

Variety.	Sex.	Vigor (1-10).	Date of bloom.	First ripe fruits.	Last fruits.	Productiveness (1-10).	Size.	Form.	Color.	Quality.	Firmness.
Lida	p	7.5	May 25	June 21	July 10	9	m	r c	b c	7	8
*Lillie Monroe	b	8.5	" 25	" 19	" 10	5	l	d c	d s	8	7
*Lincoln	p	9	" 25	" 21	" 10	9	m	r d c	b s	7	8
Little No. 15	b	9	" 24	" 19	June 30	8.5	m	b c	c	9	8
Lovett	b	9	" 24	" 19	July 5	9	m	r c	b c	8	8
Lower	b	9.2	" 26	" 19	" 5	8	l	r c	d s	8	8
*Magnate	p	8.5	" 24	" 21	" 10	6	m	l c	b s	8	8.5
Michel	b	9.8	" 24	" 16	June 30	6	s	c	b s	7	7
Middlefield	b	8.5	" 20	" 21	July 8	7.5	m	c	c	9.5	9
Miner	b	9	" 26	" 19	" 6	8.5	m to l	c	d s	8	7
Moore Early	b	9	" 25	" 21	" 10	8	m to l	b c	b s	8	8
Mrs. Cleveland	p	9.8	" 25	" 19	" 10	9	m	r b c	b s	8	8
Muskingum	b	9.8	" 29	" 22	" 7	9	m to l	d c	d r	8.5	8
*Mystic	b	9.8	" 29	" 26	" 10	6	m to l	r c	b d c	9.5	9
*Neptune	p	9.8	" 29	" 21	" 9	6	m to l	r c	d c	7	5
*No. 1 (Allen)	p	8.5	" 29	" 22	" 5	9	m	r c	b c	9	9
*No. 3 (Allen)	b	9.5	" 31	" 26	" 8	7.5	l	r c	b c	8.5	7
*No. 3 (Belt)	b	9.2	" 25	" 26	" 10	9	l	c	b l s	8	8
*No. 2 (Cameron)	b	9.2	" 24	" 20	" 9	8.5	m	l c	b c	9	8
*No. 6 (Cameron)	p b	8.5	" 29	" 22	" 10	4	m	r b c	b s	8.5	8.5
*No. 13 (Cameron)	p	7.5	" 29	" 22	" 10	8	m	r c	b c	8	7.5
*No. 1 (Engle)	b	7	" 29	" 24	" 8	5	l	i r	l c	8	8
*No. 2 (Feicht)	b	9	" 25	" 18	" 10	9.5	m to l	r c	c	8	8.5
*No. 3 (Feicht)	p	7	" 25	" 20	" 10	8	l	i c	l c	7	9
*No. 31 (Haynes)	p	9.8	" 29	" 21	" 10	5	m	i r c	b s	6	6
*No. 2 (J. S.)	b	9	" 26	" 21	" 10	6	s to m	r c	c	8	8.5
*No. 4 (J. S.)	p	9	" 24	" 21	" 9	5	m	r c	v d c	9	7.5
*No. 6 (J. S.)	p	9	" 25	" 21	" 10	9.5	l	r c	b d s	7	6
*No. 18 (Little)	b	8	" 24	" 18	" 9	8.5	m	r c	b d c	8	8.5
*No. 26 (Little)	b	8.8	" 25	" 21	" 5	9	l	i	b d s	9	8
*No. 42 (Little)	b	8.5	" 24	" 21	" 10	9	l	r c	c	9	8
*No. 1 (Stayman)	p	9.5	" 29	" 22	" 6	9.5	m	r o	l s	8	8
*No. 3 (Stayman)	b	9.8	" 25	" 21	" 10	9.5	m	l c	d c	7	8.5
*No. 34 (Thompson)	p	8.8	" 25	" 22	" 8	5	m	r c	b c	8	8
*No. 77 (Thompson)	b	7.5	" 24	" 19	" 7	9.5	s	l c	b c	7	5
*Odessa	p	9	" 29	" 23	" 7	5	l	i	b s	7	7
Ohio Centennial	p	9.4	" 29	" 25	" 9	9	l	b c	d s	9	8.5
*Ohio Monarch	b	9.8	" 29	" 23	" 10	5	l	l c	b s	9	8
Ontario	b	8.4	" 29	" 26	" 8	9.4	m to l	c	l c	9	8.5
Parker Earle	b	9.6	" 29	" 25	" 10	9.8	m	c	d s	8.5	9.5
*Pawnee	b	9	" 24	" 19	" 9	7.5	l	r c	d c	9.8	7
*Primate	b	9.2	" 26	" 21	" 10	6	m	l c	d c	6	7
Princess	p	8.8	" 26	" 21	" 10	8	m to l	r	s	9	8
Sadie	p	9	" 24	" 19	June 30	9	m	r c	d c	9	8
Saunders	b	9	" 25	" 21	July 9	8	m to l	l c	b s	7	8
Sharpless	b	9.5	" 25	" 21	" 10	8	m	b c	b c	8	8
*Smeltzer Early	b	9.	" 25	" 21	" 8	8.5	m	r c	d c	9	8.5
*Southard	b	8.8	" 22	" 16	" 4	8	l	r c	b s	7	8
*Standard	b	9.5	" 25	" 24	" 7	9	l	r c	b d c	9.5	7
*Stevens	b	9.2	" 25	" 21	June 30	9	m	r c	d c	9	8
Stimmel No. 15	p	8	" 24	" 19	" 30	8.5	m	b c	l s	9	8
Stimmel No. 20	p	8	" 24	" 21	" 30	6	s to m	l c	d c	9	8
*Surprise	b	9.2	" 28	" 21	July 7	6	m	l c	b s	8	8
*Swindle	p	9	" 26	" 23	" 5	8	m	r c	c	7	9
*Tom Walker	p	9.8	" 26	" 19	" 9	9	l	r c	d c	8	8
Van Deman	b	7	" 25	" 19	" 9	5	m	r c	l c	8	8
Westbrook	p	8	" 25	" 21	" 8	8	m	c	d c	8	9
*West Lawn	p	8.5	" 25	" 21	June 30	6	s to m	i	d s	7	7.5
*Weston	p	9.5	" 29	" 21	July 9	9.8	l	b c	b s	8	8.5
*Williams	b	8.8	" 29	" 21	" 10	8.5	l	r c	d c	8.5	9
Wilson	b	8.5	" 28	" 21	" 10	8	m	c	d c	8	9
Woolverton	b	8.5	" 29	" 21	" 10	8.5	m	l c	d c	8	9
*Yankee Doodle	p	9.8	" 25	" 19	" 5	9	l to m	r d c	b s	8	9

To test the comparative productiveness of a few of the leading varieties, the berries, upon rows eighteen rods in length, were picked and measured, and in the following table the crop obtained is given in quarts:

TABLE No. 2.—YIELD FROM ONE FORTY-FIFTH OF AN ACRE.

Variety.	Dates of picking.								
	June 20.	June 23.	June 24.	June 27.	June 29.	July 3.	July 5.	July 7.	Total quarts.
Bubach	5	10	7	13	8	14½	2½	¾	60¾
Haverland	3½	10	6	16	8	13	3	1	60½
Gandy	------	3	------	11	15	12	3	1½	40½
Lower	½	3	4½	12	11	9	2	1	43
Lida	1	2	4	4	14	5½	1	2	33½
Sucker State	1	------	4	3	10	4	7	½	29½
Moore	------	1½	3½	6	8	5	------	¾	24¾

Most of the varieties were grown in narrow matted rows, with twenty-five plants in a space of forty feet.

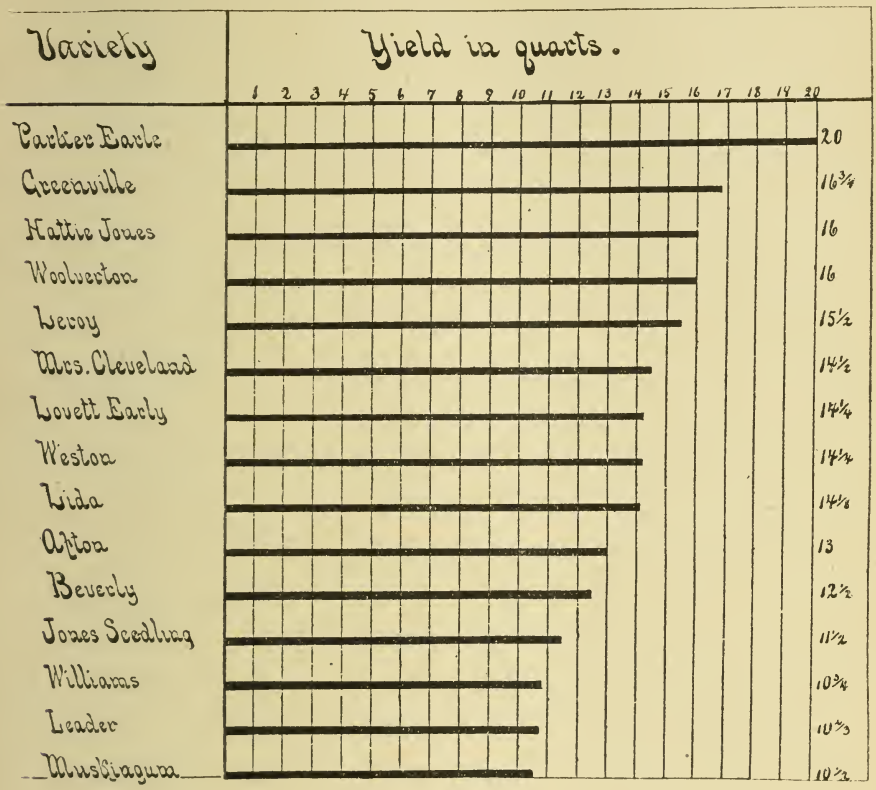
At the time of blossoming, the plot containing the new varieties was carefully gone over, and the more promising sorts were marked, that their productiveness might be accurately determined. Some varieties that were very promising early in the season were disappointing at the close, hence the variableness of the yield. The same amount of space and equal care were given to each sort. By dividing the season into three periods and giving the yield for each division of time, an attempt has been made to show which are valuable as early varieties.

TABLE No. 3.—YIELD OF TWENTY-FIVE PLANTS IN QUARTS.

Variety.	June 21.	June 24.	June 26.	June 27.	Total yield, June 21-27.	June 28.	June 29.	June 30.	Total yield, June 28-30.	July 1.	July 3.	July 7-10.	Total yield, quarts.
Afton	1	4	1	------	6	2	2	------	4	2	½	½	13
Banquet	1¾	2	1½	1	6¼	------	1½	¾	2¼	------	¾	¼	9½
Beauty	1	2	2	------	5	1¾	------	1	2¾	1	½	¼	9½
Beverly	------	2	1	------	3	1	------	4	5	------	1½	3	12½
Brunette	⅛	1½	1	1	3⅝	------	1¾	------	1¾	------	1	½	6⅞
Greenville	------	4	4	------	8	2	------	3	5	------	3	¾	16¾
Gypsy	½	2½	2	------	5	------	------	------	0	2	¼	------	7¼
Hattie Jones	1	2½	4	1	8½	------	------	4	4	------	2½	1	16
Huntsman	¼	3	3½	½	7¼	------	½	------	½	------	½	------	8¼
Jones Seedling	4	2	1	------	7	------	------	2	2	------	2	½	11½
Katie	½	3	2	------	5½	½	------	½	1	------	¼	½	7¼
Leader	1	2½	2	------	5½	2½	------	------	2½	1½	¾	½	10¾
Leroy	------	4	4½	1¼	9¾	------	2	------	2	------	3¼	½	15½
Leviathan	½	¾	2	------	3¼	1¾	------	1	2¾	------	1½	¼	7¾
Lida	------	2⅛	3½	------	5⅝	1	------	------	1	5	1½	1	14⅛
Lincoln	½	1½	2	------	4	1¾	------	1	2¾	------	1½	¼	8½
Lovett Early	1	3	------	6	10	------	1½	------	1½	------	1¼	1½	14¼
Mrs. Cleveland	1	4	4	------	9	1½	------	------	1½	2	1	1	14½
Muskingum	------	3	3	------	6	------	------	------	------	3½	½	½	10½
Parker Earle	------	½	1½	------	2	4½	------	6¼	10¾	2¾	------	4½	20
Southard	1	2	2	1	6	------	------	½	½	------	¼	------	6¾
Standard	½	1	2½	½	4½	------	------	3	3	------	1½	¼	9¼
Swindle	½	½	2	1	4	------	1¾	------	1¾	------	2	¼	8
Tippecanoe	1	2	2	1¼	6¼	------	1¼	------	1¼	------	2	½	10
Weston	½	2	3	------	5½	1	------	3¼	4¼	------	4	½	14¼
Williams	------	2	2	2	6	------	------	3	3	------	1½	¼	10¾
Woolverton	------	4	3½	------	7½	------	2	1	3	2	1½	2	16

In the following diagram, we have endeavored to show at a glance the relative productiveness of the varieties in the above table, selecting only those with a yield in excess of ten quarts from the forty feet of row.

TABLE No. 4.—YIELD OF FIFTEEN SELECTED SORTS.



NOTES UPON VARIETIES.

We append brief notes upon the vigor, productiveness, quality and firmness of some of the more promising of the varieties of comparatively recent introduction, and refer the reader to the preceding tables for further information regarding the size, shape and color of their fruit and their date of ripening, etc.

Banquet still deserves a place as a home berry. It is handsome in appearance and of high quality, but is not productive enough for market purposes.

Beder Wood—In last year's report this variety, although quite vigorous and productive, was placed in the doubtful class from its low quality and lack of firmness. It is, however, the equal of Crescent in these respects and except that it is likely to be injured by the leaf blight it would probably surpass that sort in vigor of plant and productiveness. Since it can be kept free from this disease, at a slight cost, by the use of fungicides, there is a promising future before it.

Belle should take a high place as a variety for market purposes, as it adds firmness to the other qualities desired in a profitable variety. The fruits are of good size, and are even in size, form and color.

Boynton is a promising sort, so far as the vigor and productiveness of the plants are concerned, but the berries are so small that it is not likely to become a profitable variety.

Edgar Queen is quite vigorous in plant and above the average in productiveness; the fruits often reach a large size and, although somewhat deficient in firmness and quality, it is likely to be desirable for local marketing.

Enhance has again shown itself one of the best varieties for either local market or shipping purposes. In vigor of plant and in firmness it stands near the head, while it is surpassed in fruit production by very few varieties.

Gandy is very vigorous in plant and is valued for its large, handsome fruit, its high quality and lateness in ripening, but it is rather below the standard of productiveness.

General Putnam has for four years been one of the most vigorous kinds grown and, although it does not stand particularly high in quality and firmness of fruit, it is surpassed by very few sorts in productiveness. The berries are from medium to large in size and quite regular in form. Worthy of trial.

Great Pacific, although in fruit of only medium size and moderate firmness, is so vigorous and productive that it is likely to be well worth planting as a variety for local market purposes.

Jessie and *Lida* require extra care to do well, and neither has been generally profitable, but the latter in particular has given us excellent results.

Little No. 15, now named Hoard, is a promising market sort. The plants are strong and productive, and the berries are above the average in size and firmness, and of very good quality.

Lovett is not as early as was claimed by its introducer, but it is vigorous, fairly healthy and quite productive, besides equaling, if not surpassing, the best of the old sorts in the quality and firmness of its fruit.

Michel (*Osceola*) is very vigorous in plant and is highly esteemed as a pollenizer and for early fruiting, since it furnishes a large amount of pollen and one or two pickings can be obtained from it before other varieties are ripe. While of little value as a market sort it can well have a small place in a family collection.

Mrs. Cleveland is one of the healthiest and most vigorous varieties grown. The plants are quite productive and the fruits make a fair showing in quality and firmness.

Muskingum has been grown by us for several years under the name of Kearns and, although somewhat troubled by rust, it is one of our best late varieties for sale in a local market. It is one of our most vigorous kinds, besides being quite productive, of good quality and fair firmness.

Ohio Centennial has for several years held a high rank for its vigor of growth, productiveness and excellent quality, as a variety for family or local market purposes, but it is rather deficient in firmness for a shipping variety.

Parker Earle is by many regarded as the most valuable of the comparatively new strawberries. It makes very few plants, but sets an immense

number of fruits, and with high culture and a favorable season will ripen most of them.

Princess is hardly productive enough for a market berry, but its vigor and the high quality of its fruit give it a high rank among the varieties for a family collection.

Sadie is quite vigorous and productive; although of only medium size, its quality combined with its other good features makes it well worthy of trial, especially for home use.

Stayman No. 1 needs only a greater degree of firmness to be near the head of the list, as in vigor and productiveness it compares well with any sort grown the past year.

Stayman No. 3 has the vigor and productiveness of No. 1 and the fruit is fairly firm, but it lacks in flavor.

Swindle has qualities that would make it an excellent market sort were it not for the fact that it rusts so badly that it cannot be grown to advantage, unless it is sprayed. It is a seedling of Crescent and resembles that variety in the shape of its fruit. The berries, however, are firmer and of larger size.

Van Deman made a promising showing in 1890 but since that time it has been lacking in productiveness. As this is due to a large extent to the leaf blight, the variety should not be condemned.

Westbrook has thus far seemed rather deficient in productiveness, but its firmness and fair quality render it worthy of further trial as a shipping variety.

Woolverton which has somewhat disappointed us in past years, in vigor and productiveness made an excellent showing this season and if it retains these characteristics will be a valuable shipping sort, owing to its more than usual firmness.

Although a full description of the varieties that have fruited but once upon our grounds, was given in Bulletin 100, it seems desirable to repeat here the description given of the half dozen most promising sorts, viz.: Clyde, Greenville, Leroy, No. 2 (Feicht), Weston and Yankee Doodle.

Clyde. B.—Plants from Stayman & Black, Leavenworth, Kan. First received as Cycloma. The plants are of very strong growth; leaf-stalk long, slender; leaflets usually small, ovate; color, medium green; texture, papery; teeth large, rounded. First ripe fruits June 21. Crop at best June 24-26. Fruit large to medium in size, round conical, or broad conical, dark scarlet color, flesh dark; productiveness 9.8, quality 8.5, firmness 9.2.

The plants remained healthy and crop held out well to close of season; they are productive and the berries are firm. One of the most promising of the new varieties for market purposes.

Greenville. P.—Plants from E. M. Buechly, Greenville, Ohio. Plants of strong growth; leaf-stalk usually long, quite stout, but reclining; leaflets usually large, round-ovate, turned up at edge, dark green, texture papery; teeth large, rounded. First ripe fruits June 21. Crop at best June 26-28. Fruit large, round-conical or depressed conical, sometimes ridged; color, bright crimson; flesh dark; productiveness 9.5, quality 8, firmness 7.

The plants are strong growing, healthy and productive. The crop held out well to close of season. The fruit is lacking in firmness, otherwise excellent. A promising variety for use in a local market.

Leroy. P.—Plants from J. H. Haynes, Delphi, Ind. Plants of strong growth; leaf-stalk of medium length, stout; leaflets medium size, narrow ovate, color dark green; texture papery; teeth large, pointed. First ripe fruits June 19. Crop at best June 24. Fruit large, depressed conical, sometimes ridged; color dark crimson; seeds prominent; flesh dark; productiveness 9, quality 8.5, firmness 8.

Plants are of vigorous growth and rust but little. The crop holds out well in size and productiveness. The fruit is not very firm but the seeds are prominent, making it a fairly good shipper. Early. Promising.

No. 2. (*Feicht.*) B.—Plants from David Feicht, Little York, Ohio. Plants of strong growth; leaf-stalk usually long; leaflets of medium size, ovate; teeth sharp. First ripe fruits June 18. Crop at best June 24. Fruit medium to large in size; round conical; crimson color; flesh dark; productiveness 9.5, quality 8, firmness 8.5.

Plants strong and healthy. Crop ripened early and held out well. Its productiveness makes it promising for home use or local market.

Weston. P.—Plant of strong growth; leaf-stalk long; leaflets medium to large in size, broad ovate; color, dark green; texture, thin but tough. First ripe fruits June 21. Crop at best June 24–27. Fruit large, broad conical, somewhat ridged, bright scarlet color; flesh, medium dark; productiveness 9.8, quality 8, firmness 8.5.

Plants very strong and healthy. Crop held out best of any variety. Berry of attractive appearance and fair quality, seeds prominent, making it a good shipper. One of the best varieties grown here this season.

Yankee Doodle. P.—Plants from Geo. Q. Dow, North Epping, N. H. Plants of very strong growth; leaf-stalk varies in length; leaflets large, broad ovate; color, dark green; texture, tough. First ripe fruits June 21. Crop at best June 24. Fruit large to medium in size, round conical or depressed conical, bright scarlet color, flesh light; productiveness 9, quality 8, firmness 9. Now known as *Epping.*

Plants strong, healthy and productive. Crop held out fairly well. Promising as a market sort.

Closely following the above were the following varieties, some of which seem to have considerable value:

Afton.	Gypsy.	No. 3 (Stayman).
Beauty.	Huntsman.	Pawnee.
Belle of La Crosse.	Leader.	Smeltzer.
Beverly.	No. 1 (Allen).	Standard.
Brunette.	No. 2 (Cameron).	Stevens.
Clark (Early).	No. 26 (Little).	Tom Walker.
Fairmount.	No. 6 (J. S.).	Williams.

About forty varieties marked with asterisk (*) in Table No. 1 seemed to have some good points, but were so deficient in others that further trial will be needed to determine their value. The list includes:

Accomack.	Leviathan.	No. 4 (J. S.).
Alabama.	Lillie Monroe.	No. 34 (Thompson).
Bickle.	Lincoln.	No. 77 (Thompson).
Cameronian.	Jones.	No. 18 (Little).
Cheyenne.	Katie.	No. 42 (Little).
Clark (Seedling).	Magnate.	No. 2 (J. S.).

Dutter.	Mystic.	Odessa.
Glenfield.	Neptune.	Ohio Monarch.
Harmon.	No. 3 (Allen).	Primate.
Hattie Jones.	No. 3 (Feicht).	Southard.
Hermit.	No. 6 (Cameron).	Surprise.
Iowa Beauty.	No. 13 (Cameron).	Westlawn.

Several varieties were so lacking in one or more of the characteristics of a good strawberry that they are placed in the following rejected list:

California.	E. P. Roe.	Nigger.
Dayton.	Estelle.	No. 1 (Engle).
Dr. Moraire.	Hyslop.	No. 31 (Haynes).

SUMMARY.

The old varieties Bubach, Crescent, Haverland, Warfield and Wilson are still most commonly grown as market varieties, but the Crescent and Wilson, from their liability to injury from leaf-blight, have in some sections been superseded, respectively, by Warfield and Bubach. They are all (with the exception of Wilson) pistillate varieties, and must have perfect-flowering sorts planted with them to supply pollen. Miner, Cumberland and Sharpless succeed in most localities and are excellent for the purpose. Wilson and Michel are also used. For home use, or for local markets, the Cumberland, Great Pacific and Sharpless have much to recommend them. To precede these sorts by a few days, Alpha and Michel can be used, but they will be found considerably less productive than Warfield and Crescent, which follow soon.

Lovett, Mrs. Cleveland and Townsend No. 19 are also worthy of a place among early market kinds.

It is too soon to pass upon the varieties marked with an asterisk (*) in Table 1, but of the older and yet comparatively new sorts, the most promising for market are Belle, Crawford, Enhance, Florence, Muskingum, Ohio Centennial, Parker Earle and Stayman No. 1. As will be seen from the table, Parker Earle leads the others in the list by several points, but it will not succeed without the best of care. For local markets the Beder Wood, Edgar Queen, General Putnam and Hoard seem worthy of trial.

VARIETIES OF DOUBTFUL VALUE.

Of the older sorts, the following seem to have little to commend them, and as our lists are much too long, and as many of them although sent out several years ago are not generally catalogued, they will receive no further consideration: Acme, Arlington, Auburn, Bubach No. 34, Cling-to, Clinton, Cloud, D. and D., Daisy, Dubois, Howard, Lady Rusk, Little No. 5, Logan, London No. 34, Martha, Ohio, Prince (of Berries), Shaw, Tippecanoe, Townsend No. 3, Waldron, Welch, Woodruff No. 1, Yale and Zanesfield.

STRAWBERRY LEAF-BLIGHT OR RUST.

Although some of the varieties are so nearly exempt from this disease that the crop is not noticeably lessened by it, others are so badly injured

that what would otherwise be profitable varieties have been quite generally discarded. The disease first shows itself upon the leaves as purplish spots, these enlarge and, the center tissues being destroyed, they change to a yellowish white color. The spots are often so numerous as to destroy the leaves. The fungus also works upon, and does most injury to, the flower or fruit-stalks, as very small spots, especially upon the pedicels will serve to girdle them and thus cut off the supply of food. As a result, the berries wither and dry up. The disease is generally most troublesome upon old varieties and in plantations from which one or more crops of fruit have been taken; a dry soil and a dry season also seem to increase its effect.

While much can be done by selecting varieties as little as possible subject to scab, using plants from young plantations only, planting upon rich and fairly moist soil and conserving the moisture so far as possible by heavy mulching, or frequent shallow cultivation, it will generally pay the commercial grower, in localities where the rust is troublesome, to make use of fungicides, for the destruction of the spores of the disease, as it is now known that they are entirely efficient.

The best preparation is Bordeaux mixture prepared in the usual way, using 3 pounds of copper sulphate, 3 pounds of fresh lime and 32 gallons of water. (If leaf eating insects are present it will be of advantage to add 2 ounces of Paris green for their destruction.) A bearing plantation should be sprayed after the flower-stalks have developed and just before the blossoms open. This will serve to protect the fruit-stalks and will hold in check the rust upon the leaves. The young plantations should be sprayed at the same time. This will suffice for them until July when they should receive a second and final application, but the bearing plants, if the disease is particularly destructive, will be benefited by an intermediate application soon after the fruit has set. Care should be taken not to apply Bordeaux mixture to strawberries, or other fruits, within three weeks of the time they are to be gathered, as the lime will spot the fruit and, although there may not be enough of the copper to furnish a fatal dose, it is not a desirable thing to take into the stomach.

RASPBERRIES.

The plants were set eight by three and one-half feet, and from four to six stems were left in a hill. In June, as the young canes developed, the tips were pinched off to induce them to send out side branches. After the danger of freezing weather was over in the spring, the side shoots were cut back to lengths of from six to ten inches.

TABLE No. 5.—BLACK AND HYBRID RASPBERRIES.

ABBREVIATIONS.

Size.
s, small,
m, medium.
l, large.

Form.
r, round.
c, conical.
o, ovate.

Color.
b, black. g, glossy.
p, purple. l, light.
o, orange. pu, pubescent.

Variety.	Vigor (1-10).	Date bloom.	First ripe fruits.	Last fruits.	Productiveness (1-10.)	Size.	Form.	Color.	Quality.
Ada	7	June 14	July 14	July 24	7	m	r	g b	8.
Caroline	6	" 14	" 11	" 22	8.5	m	r	l o	8
Columbian Red	9.5	" 12	" 16	Aug. 5	9	l	r c	p r	8.5
Conrath	9	" 7	" 7	July 24	9	l	r	b	8.
Cromwell	8.5	" 9	" 5	" 22	8.5	m	r	b	8
Farnsworth	8	" 12	" 11	" 22	8.5	m	r	b	8.5
Gregg	8.5	" 12	" 15	Aug. 5	8.5	l	r	b pu	7
Kansas	7	" 12	" 7	July 24	6	l	r	g b	8
Lovett	9	" 12	" 6	" 24	7	m	r	b	9
Nemaha	8.5	" 12	" 15	Aug. 4	9	l	r	b pu	7
Ohio	9	" 12	" 11	" 1	9.2	l	r	b	6
Older	7	" 12	" 9	July 24	8	l	r	b	9
Palmer	8.5	" 9	" 8	" 22	8.5	m	r	b	8.5
Progress	5	" 9	" 10	" 24	5	m	r c	b	8.5
Shaffer	9	" 14	" 16	Aug. 8	8	l	r o	p	8
Souhegan		" 11	" 5	July 25	9	m	r	b	8
Smith (Prolific)	7	" 12	" 11	" 24	9	l	r	b	9
Surrey	8	" 12	" 14	Aug. 5	5	m	r	b pu	7
Tyler	8	" 8	" 5	July 24	9	m	r	b	8
Virginia	9	" 9	" 11	" 24	9	l	r c	b	8.5

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LEWIS G. GORTON, ... Director.

CLINTON D. SMITH, M. S., .	Agriculturist.	ROBERT C. KEDZIE, M. A., M. D.. . .	Chemist.
L. R. TAFT, M. S., . . .	Horticulturist.	IRA H. BUTTERFIELD. . .	Sec. and Treas.

ADVISORY AND ASSISTANT STAFF.

F. B. MUMFORD, B. S.,	Assistant in Agriculture,	E. A. A. GRANGE, V. S.,	Consulting Veterinarian.
H. P. GLADDEN, B. S.,	" " Horticulture.	G. C. DAVIS, M. S., .	" Entomologist.
R. J. CORYELL, B. S.	" " "	CHAS. F. WHEELER, B. S.,	" Botanist.
W. L. ROSSMAN, B. S.,	" " Chemistry.	H. M. HOWE, . . .	Assistant to Director.
H. E. HARRISON, B. S.,	" " "	Mrs. L. E. LANDON. . . .	Librarian.

SUB-STATIONS.

Grayling, Crawford County, 80 acres deeded.
South Haven, Van Buren County, 10 acres rented; 5 acres deeded; Hon. T. T. Lyon, Local Agent.

FATTENING LAMBS.

F. B. MUMFORD.

Michigan has long held a prominent place as a sheep producing State. In recent years especially, her farmers have attained no small degree of success in the business of fattening sheep and lambs for the eastern markets. So extensive has the industry become, and so successful have been the feeders engaged in the business, that Michigan lambs have obtained a desirable reputation among eastern buyers. There are, in general, two classes of farmers engaged in the production of mutton. One class feed enough sheep to consume the coarse fodder and grain produced on the farm, the other depends upon purchasing all or nearly all of the food consumed. To either of these classes any experiment tending to determine the relative values of some of our common food stuffs for fattening purposes, is a matter of interest and importance.

On investigation we were led to believe that corn, oats, and bran, either alone or in combination, were the grains most commonly used in Michigan for fattening sheep. Corn and oats are produced here in great abundance, and close proximity to the great corn producing districts of the west has induced our feeders to purchase annually, thousands of car loads of western corn. Wheat bran can be obtained in nearly every county of the State and is largely purchased for mixing with other grains.

The following experiment is the first of a series intended to investigate the comparative values of these common grains for fattening purposes, and incidentally the consideration of some points of interest growing out of our experience in fattening lambs. Exact experiments tending to fix a standard of meat production for our different grains, are lacking. How many pounds of corn with a definite amount of clover hay will produce a pound

of mutton or beef? How many pounds of corn and bran, or corn and oats with a like amount of hay will produce a pound of mutton or beef? The question is an exceedingly complicated one, and its solution dependent on so many conditions that the results at best could be only approximate. However even such a standard would be of great service to the practical feeder, and the answers to the above questions would go a long way toward deciding on the selection of feeding rations. All the conditions were made as nearly identical as possible, except the grain rations. The comparison was between corn, oats, and bran, either each fed alone as a grain ration, or in combination.

PLAN OF THE EXPERIMENT.

The plan was to secure as nearly an average lot of lambs as possible, representing the class of animals usually purchased by feeders for fattening. Our aim was to obtain lambs from one flock in order that the animals used in the experiment might have the advantage of having been under the same conditions for some time previous. We were fortunate in securing a lot numbering 125 lambs of similar breeding and in all respects a desirable flock for experimental purposes. They were divided into 10 lots numbered consecutively from 1–10. They were confined in a light airy barn, well ventilated and supplying the best of conditions for the health and comfort of the animals. The feeding pens were roomy and so constructed that lambs could be confined at one end while the feeding was in progress. The lambs were at no time permitted to exercise in the open air and were not taken out except for the purpose of weighing once each week. Pure water, frequently renewed, was kept constantly before the animals, but was not weighed. In all lots except 8 and 9, the influence of the individual differences of the animals was guarded against as much as possible by carefully grading into lots of the same weight and apparent thrift. The large number of animals used in each division of the experiment also contributed toward making the averages more reliable. Care was taken to feed at regular intervals. They were fed grain and hay at 6:30 each morning, roots and silage at 12, and grain and hay again at 3:30.

In all the lots except 8 and 9, the amounts of hay and grain were supplied with reference to the appetites of the animals, while the roots were supplied at the rate of one pound per day and head.

Lots 8 and 9 were fed for the purpose of determining the relative value of roots and silage for fattening lambs, and was a continuation of a former experiment along the same line. The animals however, were apparently in no way less thrifty than the others and the results are included in the general summaries and tabulated comparisons. Lots 8 and 9 each received clover hay *ad libitum* and a grain ration consisting of one pound per day and head of bran and oats, mixed equal parts byweight. In addition lot 8 was fed ruta bagas *ad libitum* and lot 9 corn silage *ad libitum*.

December 3, 1892, the lambs were all dipped in kerosene emulsion. The excitement of dipping and discomfort following the operation probably slightly affected the gains, especially as the time of dipping was followed immediately by a fall in temperature.

All the feed except hay was weighed daily and recorded. The weights of hay were recorded for the weekly periods only. The lambs were weighed each week on the dates given in the tables. The weighing was done each

time in the morning after a feed of grain and before feeding hay or supplying with water.

The lambs were all shorn during the week ending March 8.

We were desirous of ascertaining the influence of shearing lambs during the fattening period, and a discussion of the results will be found in another portion of this bulletin.

HISTORY OF THE ANIMALS.

The 125 lambs used in this experiment were purchased on September 25, 1892. They were sired by a well bred shropshire ram from the common grade ewes of the state. Merino blood largely predominates in the common flocks of Michigan, and these we believe fairly represented the majority of lambs fed in the state. On their arrival at the college farm they were given a liberal feed of oats and hay and turned immediately on a field of rape,* where they remained 35 days. They gained 15 lbs per head while pasturing on rape and were in excellent condition when placed in winter quarters. They were fed on a light ration of grain, consisting of oats and bran, and clover hay, until Nov. 30, 1892, when the experiment proper began. From this time until March 29, 1893, at which time the experiment terminated, all food consumed was carefully weighed and a daily record kept.

KIND AND COST OF FOOD STUFFS.

The corn used in this experiment was fed whole and was either grown on the college farm or in the immediate neighborhood, except a small quantity of western corn purchased to complete the experiment.

The oats were of the American Banner variety, grown on the college farm and of prime quality. They were also fed whole.

The wheat bran was purchased of our local millers and was the residue from the manufacture of roller process flour.

The clover hay was an excellent sample of bright, well cured clover and was readily eaten by the lambs in all lots. The silage was produced from a medium maturing yellow dent corn. The corn was well glazed at the time of the siloing and the silage resulting was probably above the average in quality. It was cut in one-half inch lengths and the filling alternated between two silos, filling the first one day and the other the next.

Silage is a very indefinite substance; its value depends so much on the time of harvesting, kind of corn used and manner of filling that the use of tables already established is attended with some uncertainty. The silage in this experiment was analyzed and its composition found to agree very closely with the figures given in the tables.

The ruta bagas were of the variety known as Skirving's Purple Top. They were sliced before feeding and were greedily eaten by the lambs in all lots.

* The field of rape comprised 12 acres and was of the variety known as Hybrid Bird rape.

The following table gives the prices of food stuffs as quoted to us by a local dealer:

Corn	$0 56 per bushel.
Oats	32 " "
Bran	13 75 per ton.
Hay	7 00 " "
Silage	2 50 " "
Ruta Bagas	2 50 " "

When in any case a mixture of grain was used the mixture was invariably composed of equal parts by weight as follows:

Corn and bran equal parts by weight.

Corn and oats equal parts by weight.

Oats and bran equal parts by weight.

Corn, oats and bran equal parts by weight.

Below are arranged the average daily fodder rations consumed by each lamb:

AVERAGE DAILY RATIONS FOR ONE LAMB.

Lot 1.

Corn	1.47 lbs.
Roots	1. "
Hay	1.4 "
Nutritive Ratio	1:7.8 "
Total cost	2.09 cts.

Lot 2.

Oats	1.64 lbs.
Hay	1.4 "
Roots	1. "
Nutritive ratio	1:6.4 "
Total cost	2.27 cts.

Lot 3.

Bran	1.49 lbs.
Roots	1. "
Hay	1.45 "
Nutritive ratio	1:5.13 "
Total cost	1.66 cts.

Lot 4.

Corn	.81 lbs.
Oats	.81 "
Hay	1.43 "
Roots	1. "
Nutritive ratio	1:7 "
Total cost	2.25 cts.

Lot 5.

Corn	.83 lbs.
Bran	.83 "
Hay	1.42 "
Roots	1. "
Nutritive ratio	1:6.59 "
Total cost	2.02 cts.

Lot 6.

Oats	.82 lbs.
Bran	.82 "
Hay	1.44 "
Roots	1. "
Nutritive ratio	1:5.6 "
Total cost	2.01 cts.

Lot 7.

Corn	.55 lbs.
Oats	.55 "
Bran	.55 "
Hay	1.4 "
Roots	1. "
Nutritive ratio	1:6. "
Total cost	2.09 cts.

Lot 8.

Oats	.5 lbs.
Bran	.5 "
Hay	1.20 "
Roots	5.6 "
Nutritive ratio	1:6.25 "
Total cost	1.89 cts.

Lot 9.

Oats	.5 lbs.
Bran	.5 "
Hay	.82 "
Silage	3.40 "
Nutritive ratio	1:7.6 "
Total cost	1.54 cts.

Lot 10.

Corn	.84 lbs.
Oats	.84 "
Bran	.84 "
Hay	.62 "
Roots	1.61 "
Nutritive ratio	1:6.8 "
Total cost	2.67 cts.

DETAILED RECORD OF EXPERIMENT.

The following tables contain the weekly records of food consumed and gains resulting from each lot. For convenience of reference the financial statement is placed immediately following the records of feed and gain:

LOT 1. (10 Lambs.)

Weekly record of feed, weight and gain. (Grain ration—Corn.)

Dates.	Corn.	Hay.	Roots.	Total weight.	Total gain.	Avg. weight.	Avg. weekly gain.
November 30				830		83	
December 7	52	105	70	866	36	86	3.6
" 14	70	105	70	875	9	87	.9
" 21	70	105	70	884	9	88	.9
" 28	70	105	70	904	20	90	2
January 4	70	100	70	910	6	91	.6
" 11	70	100	70	952	42	95	4.2
" 18	105	100	70	1,006	54	100	5.4
" 25	105	100	70	1,020	14	102	1.4
February 1	140	105	70	1,045	25	104	2.5
" 8	140	105	70	1,069	24	107	2.4
" 15	123	105	70	1,092	23	109	2.3
" 22	108	90	70	1,130	38	113	3.8
March 1	106	90	70	1,124	-6	112	-.6
" 8	120	90	70	1,135	11	113	1.1
" 15	138	90	70	1,175	40	117	4
" 22	140	90	70	1,229	54	123	5.4
" 29	130	90	70	1,273	44	127	4.4
Totals	1,757	1,675	1,190		443		

FINANCIAL STATEMENT.

Lot 1. (10 lambs.)

DEBIT.

To 10 lambs, 830 lbs. @ 5 cts.	$41 50
shearing 10 lambs	70
To feed as follows:	
1,757 lbs. corn @ 56 cts. per bu.	17 57
1,190 lbs. roots @ $2.50 per ton	1 49
1,670 lbs. hay @ $7.00 per ton	5 85
Total expenditures	$67 11

CREDIT.

By 10 lambs, 1,205.5 lbs. @ 5 cts.	$60 27
wool, 67.5 lbs. @ 21 cts.	14 18
Total receipts	$74 45
Profit on one lamb	73

LOT 2. (10 Lambs).

Weekly record of feed, weight and gain. (Grain ration—Oats).

Dates.	Oats.	Hay.	Roots.	Total weight.	Total gain.	Avg. weight.	Avg. weekly gain.
November 30				834		83	
December 7	52	103	70	856	22	85	2.2
" 14	70	103	70	866	10	86	1
" 21	70	103	70	877	11	88	1.1
" 28	70	103	70	870	-7	87	-.7
January 4	70	118	70	850	-20	85	-2
" 11	70	118	70	916	66	91	6.6
" 18	105	118	70	950	34	95	3.4
" 25	105	118	70	958	8	96	.8
February 1	140	100	70	1,000	42	100	4.2
" 8	148	100	70	1,019	19	102	1.9
" 15	148	100	70	1,038	19	104	1.9
" 22	154	100	70	1,064	26	106	2.6
March 1	154	82	70	1,094	30	109	3
" 8	154	82	70	1,085	-9	108	-.9
" 15	154	82	70	1,123	38	112	3.8
" 22	154	82	70	1,173	50	117	5
" 29	145	82	70	1,213	40	121	4
Totals	**1,963**	**1,694**	**1,190**		**379**		

FINANCIAL STATEMENT.

Lot 2. (10 Lambs.)

DEBIT.

To 10 lambs, 834 lbs. @ 5 cts.	$41 70
shearing 10 lambs	70
To feed as follows:	
1,963 lbs. oats @ 32 cts. per bu.	19 63
1,160 lbs. roots @ $2.50 per ton	1 49
1,687 lbs. hay @ $7.00 per ton	5 90
Total expenditures	$69 42

CREDIT.

By 10 lambs, 1,145.5 lbs. @ 5 cts.	$57 27
wool, 67.5 lbs. @ 21 cts.	14 18
Total receipts	$71 45
Profit on one lamb	20

LOT 3. (10 Lambs.)

Weekly record of feed, weight and gain. (Grain ration—Bran.)

Dates.	Bran.	Hay.	Roots.	Total weight.	Total gain.	Avg. weight.	Avg. weekly gain.
November 30				824		82	
December 7	52	104	70	842	18	84	1.8
" 14	70	104	70	852	10	85	1
" 21	70	104	70	864	12	86	1.2
" 28	70	104	70	882	18	88	1.8
January 4	70	118	70	862	-20	86	-2
" 11	70	118	70	896	34	89	3.4
" 18	105	118	70	932	36	93	3.6
" 25	105	118	70	944	12	94	1.2
February 1	125	105	70	944	0	94	0
" 8	119	105	70	954	10	95	1
" 15	119	105	70	960	6	96	.6
" 22	122	105	70	994	34	99	3.4
March 1	137	84	70	1,025	31	102	3.1
" 8	140	84	70	1,020	-5	102	-.5
" 15	146	84	70	1,022	2	102	.2
" 22	138	84	70	1,054	32	105	3.2
" 29	121	84	70	1,066	12	106	1.2
Totals	**1,779**	**1,728**	**1,190**		**242**		

FINANCIAL STATEMENT.

Lot 3. (10 Lambs).

DEBIT.

To 10 lambs 824 lbs. @ 5 cts.	$41 20
shearing 10 lambs	70
To feed as follows:	
1,779 lbs. bran @ $13.75 per ton	12 22
1,190 lbs. roots @ $2.50 " "	1 49
1,737 lbs. hay @ $7.00 " "	6 08
Total expenditures	$61 69

CREDIT.

By 10 lambs, 998.5 lbs. @ 5 cts.	$49 92
wool 67.5 lbs. @ 21 cts.	14 18
Total receipts	$64 10
Profit on one lamb	24

LOT 4. (10 Lambs.)

Weekly record of feed, weight and gain. (Grain ration—Corn and oats.)

Dates.	Corn and oats.	Hay.	Roots.	Total weight.	Total gain.	Avg. weight.	Avg. weekly gain.
November 30				842		84	
December 7	52	116	70	864	22	86	2.2
" 14	70	116	70	872	8	87	.8
" 21	70	116	70	882	10	88	1
" 28	70	116	70	898	16	90	1.6
January 4	70	102	70	900	2	90	.2
" 11	70	102	70	936	36	93	3.6
" 18	105	102	70	988	52	99	5.2
" 25	105	102	70	1,000	12	100	1.2
February 1	140	96	70	1,039	39	104	3.9
" 8	148	96	70	1,056	17	105	1.7
" 15	148	96	70	1,078	22	108	2.2
" 22	134	96	70	1,110	32	111	3.2
March 1	140	91	70	1,138	28	114	2.8
" 8	150	91	70	1,160	22	116	2.2
" 15	154	91	70	1,177	17	118	1.7
" 22	154	91	70	1,224	47	122	4.7
" 29	155	91	70	1,278	54	128	5.4
Totals	**1,935**	**1,711**	**1,190**		**436**		

FINANCIAL STATEMENT.

Lot 4. (10 Lambs.)

DEBIT.

To 10 lambs 842 lbs. @ 5 cts.	$42 10
shearing 10 lambs	70
To feed as follows:	
1,935 lbs. corn and oats	19 35
1.190 lbs. roots @ $2.50 per ton	1 49
1,711 lbs. hay at $7.00 " "	5 98
Total expenditures	$69 62

CREDIT.

By 10 lambs 1,210.5 lbs. @ 5 cts	$60 52
wool 67.5 lbs. @ 21 cts.	14.18
Total receipts	$74 70
Profit on one lamb	51

LOT 5. (10 Lambs.)

Weekly record of feed, weight and gain. (Grain ration—Corn and bran.)

Dates.	Corn and bran.	Hay.	Roots.	Total weight.	Total gain.	Avg. weight.	Avg. weekly gain.
November 30				866		86	
December 7	52	120	70	880	14	88	1.4
" 14	70	120	70	890	10	89	1
" 21	70	120	70	902	12	90	1.2
" 28	70	120	70	916	14	91	1.4
January 4	70	104	70	910	-6	91	-.6
" 11	70	104	70	946	36	94	3.6
" 18	105	104	70	990	44	99	4.4
" 25	105	104	70	1,010	20	101	2
February 1	140	98	70	1,020	10	102	1
" 8	148	98	70	1,045	25	104	2.5
" 15	148	98	70	1,072	27	107	2.7
" 22	154	98	70	1,122	50	112	5
March 1	154	82	70	1,148	26	115	2.6
" 8	154	82	70	1,144	-4	114	-.4
" 15	154	82	70	1,126	-11	112	-1.8
" 22	154	82	70	1,198	72	120	7.2
" 29	155	82	70	1,224	26	122	2.6
Totals	**1,973**	**1,698**	**1,190**		**358**		

FINANCIAL STATEMENT.

Lot 5. (10 Lambs.)

DEBIT.

To 10 lambs 866 lbs. @ 5 cts.	$43 30
shearing 10 lambs	70
To feed as follows:	
1,973 lbs. corn and bran	16 64
1,190 lbs. roots @ $2.50 per ton	1 49
1,698 lbs. hay at $7.00 " "	5 94
Total expenditures	$68 07

CREDIT.

By 10 lambs 1,156.5 lbs.@ 5 cts	$57 82
wool 67.5 @ 21 cts	14 18
Total receipts	$72 00
Profit on one lamb	39

LOT 6. (15 Lambs.)

Weekly record of feed, weight and gain. (Grain ration—Oats and bran).

Dates.	Oats and bran.	Hay.	Roots.	Total weight.	Total gain.	Avg. weight.	Avg. weekly gain.
November 30				1,258		84	
December 7	72	157	105	1,286	28	86	1.8
" 14	105	157	105	1,293	7	86	.4
" 21	105	157	105	1,302	9	87	.4
" 28	105	157	105	1,324	22	88	1.4
January 4	105	156	105	1,302	-22	87	-1.4
" 11	105	156	105	1,368	66	91	4
" 18	157	156	105	1,408	40	94	2.8
" 25	157	156	105	1,460	52	97	3.5
February 1	210	150	105	1,482	22	99	1.4
" 8	222	150	105	1,521	39	101	2.5
" 15	222	150	105	1,560	39	104	2.6
" 22	231	150	105	1,596	36	106	2.4
March 1	231	146	105	1,624	28	108	1.8
" 8	231	146	105	1,642	18	109	1.3
" 15	213	146	105	1,659	17	111	1.3
" 22	231	146	105	1,771	112	118	7.4
" 29	233	146	105	1,799	28	120	1.8
Totals	**2,935**	**2,582**	**1,785**		**541**		

FINANCIAL STATEMENT.

Lot 6. (15 Lambs.)

DEBIT.

To 15 lambs, 1,258 lbs. @ 5 cts.	$62 90
shearing 15 lambs	1 05
To feed as follows:	
2,935 lbs. oats and bran	24 76
1,785 lbs. roots @ $2.50 per ton	2 23
2,580 lbs. hay @ $7.00 per ton	9 03
Total expenditures	$99 97

CREDIT.

By 15 lambs, 1,697.75 lbs. @ 5 cts.	$84 88
wool 101.25 lbs. @ 21 cts.	21 26
Total receipts	$106 14
Profit on one lamb	41

LOT 7. (15 Lambs.)

Weekly record of feed, weight and gain. (Grain ration—Corn, oats and bran.)

Dates.	Corn, oats and bran.	Hay.	Roots.	Total weight.	Total gain.	Avg. weight.	Avg. weekly gain.
November 30				1,250		83	
December 7	72	150	105	1,294	44	86	3
" 14	105	150	105	1,304	10	87	.7
" 21	105	150	105	1,316	12	88	.8
" 28	105	150	105	1,344	28	90	2
January 4	105	154	105	1,320	-24	88	-1.6
" 11	105	154	105	1,380	60	92	4
" 18	157	154	105	1,430	50	95	3.3
" 25	157	154	105	1,486	56	99	3 7
February 1	210	135	105	1,492	6	100	.4
" 8	222	135	105	1,530	38	102	3
" 15	222	135	105	1,568	38	105	3
" 22	231	135	105	1,625	57	108	4
March 1	231	145	105	1,666	41	111	3
" 8	231	145	105	1,690	24	113	1.6
" 15	231	145	105	1,703	13	114	1
" 22	231	145	105	1,787	84	119	6
" 29	233	145	105	1,831	44	122	3
Totals	**2,953**	**2,481**	**1,785**		**581**		

FINANCIAL STATEMENT.

Lot 7. (15 Lambs.)

DEBIT.

To 15 lambs. 1,250 lbs. @ 5 cts.	$62 50
shearing 15 lambs	1 05
To feed as follows:	
2,953 lbs. corn, oats and bran	26 75
1,785 lbs. roots @ $2.50 per ton	2 23
2.481 lbs. hay @ $7.00 per ton	8 68
Total expenditures	$101 21

CREDIT.

By 15 lambs. 1,729.75 lbs. @ 5 cts.	$86 49
wool 101.25 lbs. @ 21 cts.	21 26
Total receipts	$107 75
Profit on one lamb	44

LOT 8. (20 Lambs.)

Weekly record of feed, weight and gain. (*Grain ration—Oats and bran.*)

Dates.	Oats and bran.	Hay.	Roots.	Total weight.	Total gain.	Avg. weight.	Avg. weekly gain.
November 30				1,462		73	
December 7	105	143	100	1,486	24	74	1.2
" 14	140	143	318	1,520	34	76	1.7
" 21	140	143	485	1,556	36	78	1.8
" 28	140	143	560	1,632	76	81	3.8
January 4	140	145	560	1,605	-27	80	-1.3
" 11	140	145	560	1,650	45	82	2.2
" 18	140	145	620	1,706	56	85	2.8
" 25	140	145	800	1,750	44	87	2.2
February 1	140	148	900	1,750	0	87	0
" 8	140	148	1,010	1,783	33	89	1.6
" 15	140	148	1,020	1,816	33	90	1.6
" 22	140	148	1,040	1,866	50	93	2.5
March 1	140	139	1,020	1,909	43	95	2.1
" 8	140	139	1,020	1,936	27	96	1.3
" 15	140	139	1,020	1,925	-11	96	-.5
" 22	140	139	1,120	2,003	78	100	3.9
" 29	140	139	960	2,051	48	102	2.4
Totals	**2,345**	**2,439**	**13,413**		**589**		

FINANCIAL STATEMENT.

Lot 8. (*20 lambs.*)

DEBIT.

To 20 lambs, 1,462 lbs. @ 5 cts.	$73 10
shearing 20 lambs	1 40
To feed as follows:	
2,345 lbs. bran and oats	19 86
13,413 lbs. roots @ $2.50 per ton	16 76
2,439 lbs. hay @ $7.00 per ton	8 51
Total expenditures	$119 63

CREDIT.

By 20 lambs, 1,916 lbs. @ 5 cts.	$95 80
wool, 135 lbs. @ 21 cts.	28 35
Total receipts	$124 15
Profit on 1 lamb	22

LOT 9. (20 Lambs.)

Weekly record of feed, weight and gain. (Grain ration—Oats and bran.)

Dates.	Oats and bran.	Hay.	Silage.	Total weight.	Total gain.	Avg. weight.	Avg. weekly gain.
November 30				1,490		74	
December 7	105	151	100	1,514	24	75	1.2
" 14	140	151	318	1,558	44	78	2.2
" 21	140	151	485	1,598	40	79	2
" 28	140	151	560	1,636	38	81	1.9
January 4	140	93	375	1,616	-20	80	-1
" 11	140	93	375	1,682	66	84	3.3
" 18	140	93	505	1,744	62	87	3.1
" 25	140	93	550	1,752	8	87	.4
February 1	140	112	525	1,762	10	88	.5
" 8	140	112	525	1,797	35	89	1.7
" 15	140	112	525	1,832	35	91	1.7
" 22	140	112	545	1,880	48	94	2.4
March 1	140	110	560	1,890	10	94	.5
" 8	140	110	560	1,940	50	97	2.5
" 15	140	110	560	1,950	10	97	.5
" 22	140	110	560	2,018	68	100	3.4
" 29	140	110	480	2,076	58	103	2.9
Totals	**2,345**	**1,974**	**8,108**		**586**		

FINANCIAL STATEMENT.

Lot 9. (20 lambs.)

DEBIT.

To 20 lambs, 1,490 lbs. @ 5 cts.	$74 50
shearing 20 lambs	1 40
To feed as follows:	
2,345 lbs. oats and bran	19 86
8,108 lbs. silage @ $2.50 per ton	10 13
1,974 lbs. hay @ $7.00 per ton	6 91
Total expenditures	$112 80

CREDIT.

By 20 lambs, 1,941 lbs. at 5 cts.	$97 05
wool, 133 lbs. @ 21 cts.	28 35
Total receipts	$125 40
Profit on one lamb	68

LOT 10. (5 Lambs.)—*Self feed.*

Weekly record of feed, weight and gain. (Grain ration—Corn, oats and bran.)

Dates.	Corn, oats and bran.	Hay.	Roots.	Total weight.	Total gain.	Avg. weight.	Avg. weekly gain.
December 7				422		84	
" 14	134	14	100	431	9	86	1.8
" 21	78	17	110	440	9	88	1.8
" 28	120	15	105	452	12	90	2.4
January 4	36	16	85	464	12	93	2.4
" 11	105	19.5	35	478	14	95	2.8
" 18	104	34.5	35	486	8	96	1.6
" 25	60	18	35	498	12	99	2.4
February 1	131	30	35	509	11	101	2.2
" 8	30	16	35	523	14	104	2.8
" 15	95	33	35	538	15	106	3
" 22	67	15	35	550	12	110	2.4
March 1	100	36	35	552	2	110	.4
Totals	**1,060**	**264**	**680**		**130**		

FINANCIAL STATEMENT.

Lot 10. (5 lambs.)

DEBIT.

To 5 lambs, 422 lbs. @ 5 cts.	$21 10
shearing 5 lambs	35
To feed as follows:	
1,060 lbs. corn, oats and bran	9 49
264 lbs. hay @ $7.00 per ton	92
680 lbs. roots @ $2.50 per ton	85
Total expenditures	$32 71

CREDIT.

By 5 lambs, 518.25 lbs. @ 5 cts.	$25 91
wool, 33.75 lbs. @ 21 cts.	7 09
Total receipts	$33 00
Profit on one lamb	06

SUMMARY OF TOTALS.

Totals of food, weights and gains.

Lot.	No. lambs.	Grain.	Hay.	Roots.	Cost of feed.	Gain.	Average weekly gain.
1	10	1,757	1,675	1,190	$24 92	443	2.6
2	10	1,963	1,694	1,190	27 05	379	2.2
3	10	1,779	1,728	1,190	19 77	242	1.4
4	10	1,735	1,711	1,190	26 83	436	2.6
5	10	1,973	1,698	1,190	24 07	358	2.1
6	15	2,935	2,582	1,785	36 02	541	2.1
7	15	2,953	2,481	1,785	37 36	581	2.3
8	20	2,345	2,439	13,413	45 08	589	1.7
9	20	2,345	1,974	*8,108	36 82	586	1.7
10	5	1,060	264	680	11 26	130	2.16

* Silage.

EXPLANATIONS.

The tables for each lot contain a weekly record of kind and amounts of food consumed, total weight at end of each period, total gain of entire lot, average weight and average weekly gain of one sheep.

The summary of totals contains number of lambs in each lot, total weights of food consumed, cost of food, and gain of each lot, and average gain of one sheep for one week.

Lot 10 which was fed with a "self feed" were under experiment for 12 weeks only, and in every case the totals and averages are based on the feeding period of 12 weeks.

The lambs in all lots were shorn during the week ending March 8, 1893, and weights of wool recorded after the above date, to avoid confusion in the tables, the total weights are found by adding weight of wool to actual weight of shorn sheep.

The lambs averaged 6.75 lbs. of wool per head, and this average amount is in each case calculated in the financial statement. The wool was consigned to a Philadelphia firm and netted 21 cts. here.

The minus (—) sign before numbers in column of gains indicates a loss.

The lambs fed well, although the gains were not as satisfactory as in other experiments conducted at this station. During the week ending Jan. 4, the lambs were nearly all "off their feed," caused by overfeeding. With this exception, the lambs were at all times apparently thriving well.

TABLE I.—*Showing weekly gain, cost of 1 lb. gain, pounds of grain to 1 lb. gain, protein fed per day per 1,000 lbs. of sheep live weight, carbohydrates fed per day per 1,000 lbs. of sheep live weight, and nutritive ratio.*

Lot.	Distinguishing rations.	Weekly gain.	Cost of 1 pound gain.	Pounds of grain fed to 1 pound gain.	Protein fed per day per 1,000 pounds.	Carbohydrates fed per day per 1,000 lbs.	Nutritive ratio.
1	Corn	2.6	$.056	3.96	2.2	16.7	1:7.8
2	Oats	2.2	.073	5.17	2.4	15.39	1:6.4
3	Bran	1.4	.081	7.35	2.9	14.8	1:5.1
4	Corn and oats	2.6	.061	4.4	2.37	16.3	1:7
5	Corn and bran	2.1	.067	5.5	2.56	16.2	1:6.5
6	Oats and bran	2.1	.066	5.4	2.6	14.9	1:5.6
7	Corn, oats and bran	2.3	.064	5.08	2.6	16	1:6
8	Roots	1.7	.076	3.98	2.4	15.4	1:6.2
9	Silage	1.7	.062	4	2.2	14.5	1:7.6
10	"Self feed"	2.16	.086	8.15	3	19.2	1:6.8

The pounds of grain required to produce a pound of gain in the various lots is an interesting point. From table 1 it will be observed that the least number of pounds required for 1 lb. gain is in Lot 1, fed with corn and clover hay. The largest quantity of grain eaten to produce 1 pound gain was in Lot 10, fed with a "self feed." In all rations containing corn the amount of grain necessary to produce 1 pound of gain, is less than in the other rations with the exception of lambs fed with a "self feed" as mentioned above.

POINTS OF INTEREST.

It has been argued by practical feeders that the results obtained from comparing lots of 1, 2 or 3 animals are unreliable. The individual differences of the animals are often so great that conclusions based upon so few animals may be misleading. In the experiment under discussion the utmost care was taken not only to carefully divide the animals into lots of equal weight, and general thrift, but also to employ a sufficiently large number of animals in each lot, so that as much as possible, we might overcome the influence of the individual differences of the animals.

The length of the experiment also, (119 days) will contribute toward making the results the more valuable.

TABLE 2.—*Gains by weeks.*

Dates.	Lot 1.	Lot 2.	Lot 3.	Lot 4.	Lot 5.	Lot 6.	Lot 7.	Lot 8.	Lot 9.	Lot 10.	Weekly average.
Nov. 30											
Dec. 7	3.6	2.2	1.8	2.2	1.4	1.8	3.0	1.2	1.2		2.0
" 14	.9	1.0	1.0	.8	1.0	.4	.7	1.7	2.2	1.8	1.8
" 21	.9	1.1	1.2	1.0	1.2	.4	.8	1.8	2.0	1.8	1.2
" 28	1.0	-.7	1.8	1.6	1.4	1.4	2.0	3.8	1.9	2.4	1.6
Jan. 4	1.6	-2	-2	.2	-.6	-1.4	-1.6	-1.3	-1	2.4	-.5
" 11	4.2	6.6	3.4	3.6	3.6	4.0	4.0	2.2	3.3	2.8	3.7
" 18	5.4	3.4	3.6	5.2	4.4	2.8	3.3	2.8	3.1	1.6	3.5
" 25	1.4	.8	1.2	1.2	2.0	3.5	3	2.2	.4	2.4	1.8
Feb. 1	2.5	4.2	0	3.9	1.0	1.4	.4	0	.5	2.2	1.6
" 8	2.4	1.9	1.0	1.7	2.5	2.5	3.0	1.6	1.7	2.8	2.1
" 15	2.3	1.9	.6	2.2	2.7	2.6	3.0	1.6	1.7	3	2.1
" 22	3.8	2.6	3.4	3.2	5.0	2.4	4.0	2.5	2.4	2.4	3.1
Mar. 1	-.6	3.0	3.1	2.8	2.6	1.8	3.0	2.1	.5	.4	1.8
" 8	1.1	-.9	-.5	2.2	-.4	1.3	1.6	1.3	2.5		.9
" 15	4.0	3.8	.2	1.7	1.8	1.3	1.0	-.5	.5		1.1
" 22	5.4	5.0	3.2	4.7	7.2	7.4	6.0	3.9	3.4		5.1
" 29	4.4	4.0	1.2	5.4	2.6	1.8	3.0	2.4	2.9		3

Table 2 is added for convenience of reference. It contains the average weekly gain of one lamb in each lot for each week during the entire period of 17 weeks. The averages of the 10 lots for each week will be found in column headed "weekly average."

The amount of hay eaten with the different grain rations is a matter of interest. Table 3 gives the proportion of grain to hay. The lambs receiving a large daily ration of roots consumed a large quantity of hay as compared with grain, and those fed with "self feed" consumed relatively a very small amount of hay. Lot 1 fed corn, and Lot 3 fed oats, consumed a relatively larger amount of hay than did the other lots in the distinctively grain test.

TABLE 3.—*Relation of hay to grain.*

Lot.	Pounds hay.	Pounds grain.
1	.96	1
2	.85	1
3	.97	1
4	.88	1
5	.86	1
6	.87	1
7	.84	1
8	1.40	1
9	.84	1
10	.24	1

One thing seems to be quite clearly indicated by this experiment, viz.: that small gains are not necessarily unprofitable, nor large gains a sure index of profitable food consumption. (Compare Lots 9 and 10.) Lot 9 made an average weekly gain of 1.7 lbs. per head, and yielded a profit of 63 cts. per head. Lot 10 made a weekly gain of 2.16 lbs. per head and yielded a profit of only 6 cts per head.

SELF FEED.

By "self feed" is understood any arrangement which admits of free access to grain at all times.

It is a common practice among feeders in many parts of this state to use a "self feed." Many employ this method during the whole feeding period. Others believe that better results are obtained by using it during the latter period of fattening. So common is this practice that it was thought advisable to investigate the value of this method as compared with regular times of feeding.

To determine its value five lambs were placed in Lot 10. They were fed clover hay *ad libitum* and 1 pound of ruta bagas per day and head.

The grain ration consisted of corn, oats, and bran mixed equal parts by weight. This grain ration was placed in a conveniently constructed box arranged so that lambs could feed at will. Some care was necessary in accustoming the lambs to the heavy feed of grain before they were allowed constant access to the "self feed" arrangement.

The lambs were fed thus from December 7, 1892, to March 1, 1893, a period of twelve weeks. During this time they consumed 1,060 lbs. of grain, 264 lbs. of hay, and 680 lbs. of roots. They gained during this time 130 lbs. or 2.16 lbs. per head and week. It will be observed that the lambs ate a large amount of grain, and a relatively small amount of hay. Although the gain was slightly above the average, and the lambs apparently well fattened, it will be noticed from table 1, that as compared with the other lots the gain was made at the highest cost per pound. It will also be observed that it required more pounds of grain to one pound of gain than in any of the other lots.

It will be seen from the financial statement that of all the lots these were fed at the least profit; namely 6 cts. per lamb. Owing to the small number of lambs in this division of the experiment, we are not prepared to say that the "self feed" is unprofitable, without further investigation. The indications of this experiment, however, point to the fact that it may be an expensive method of fattening lambs.

ROOTS VS. SILAGE FOR FATTENING LAMBS.

In a former experiment (bulletin 84) conducted at this station some of the conclusions drawn were as follows:

"1. This experiment indicates the superiority of roots (sugar beets) over silage for fattening lambs.

2. Either roots or silage may enter largely into the fattening ration and allowing a reasonable valuation on each, may be fed with profit.

3. Lambs may be successfully fattened without the use of a heavy grain ration."

To further investigate this subject 40 lambs were divided into two lots and appear in the tables as lots 8 and 9. The silage used in this experiment was above the average in quality. The roots used were ruta bagas. The results appear in former pages of this bulletin.

The gains produced by each ration were the same, namely: 1.7 lbs, per week and head. It will be observed, however, that although the quantity of grain fed was the same, that the lambs fed ruta bagas consumed a considerably larger quantity of hay than those fed silage. The amount of roots eaten by Lot 8, as compared with the silage eaten by Lot 9, was very large.

The profit on Lot 8, fed roots, was 22 cts. on each lamb, that on Lot 9 fed silage was 63.

We are led to conclude, therefore, that considering the ruta bagas and silage used in this experiment (see page 5) the silage produced the same gain at a less cost.

The results of this experiment as compared with bulletin 84 would seem to indicate the superiority of sugar beets over ruta bagas for fattening lambs.

The conclusions quoted above (bulletin 84, Michigan) are still further confirmed by this experiment.

SHEARING LAMBS DURING THE FATTENING PERIOD.

Shearing lambs during some part of the feeding period has been practiced with more or less success in this state. In many cases the animals are shorn in the fall. More often, however, the shearing is done sometime in March, 3 or 4 weeks before it is desired to dispose of the sheep. To observe the advantages, if any, resulting from this practice, all the animals in this experiment were shorn during the week ending March 8, 1893. They were continued on the rations as before until March 29, 1893, thus making a period of 3 weeks after shearing. Taking the average of all the lots the gain of 1 lamb in one week, for the 13 weeks before shearing was 1.9 lbs. The average gain after shearing was 2.8 lbs.

During the week of shearing the lambs made very small gains. The most rapid gains of any in the experiment were made during the period following the shearing. The results of this trial are apparently favorable to shearing when lambs are confined in warm quarters.

TEMPERATURE AS AFFECTING GAINS.

A study of the tables will reveal the fact that some influence outside and in spite of the food, to some extent controlled the gains. It has often been remarked by feeders that sheep feed better in a cold, than in an open winter. How potent this influence may be, or whether it is of sufficient importance to merit our consideration can be determined only by more extended observation. It will appear from the tables that there is a general falling off in gain, produced by the same quantity of food, during certain weeks. By comparing the outside temperature for the weeks showing a decreased gain or *vice versa*, it was noticed that a falling off in gain was quite generally accompanied by a rise in temperature, and an increased gain seemed to be quite generally accompanied by a fall in temperature. Diagram I illustrates this apparent relation between temperature and gain.

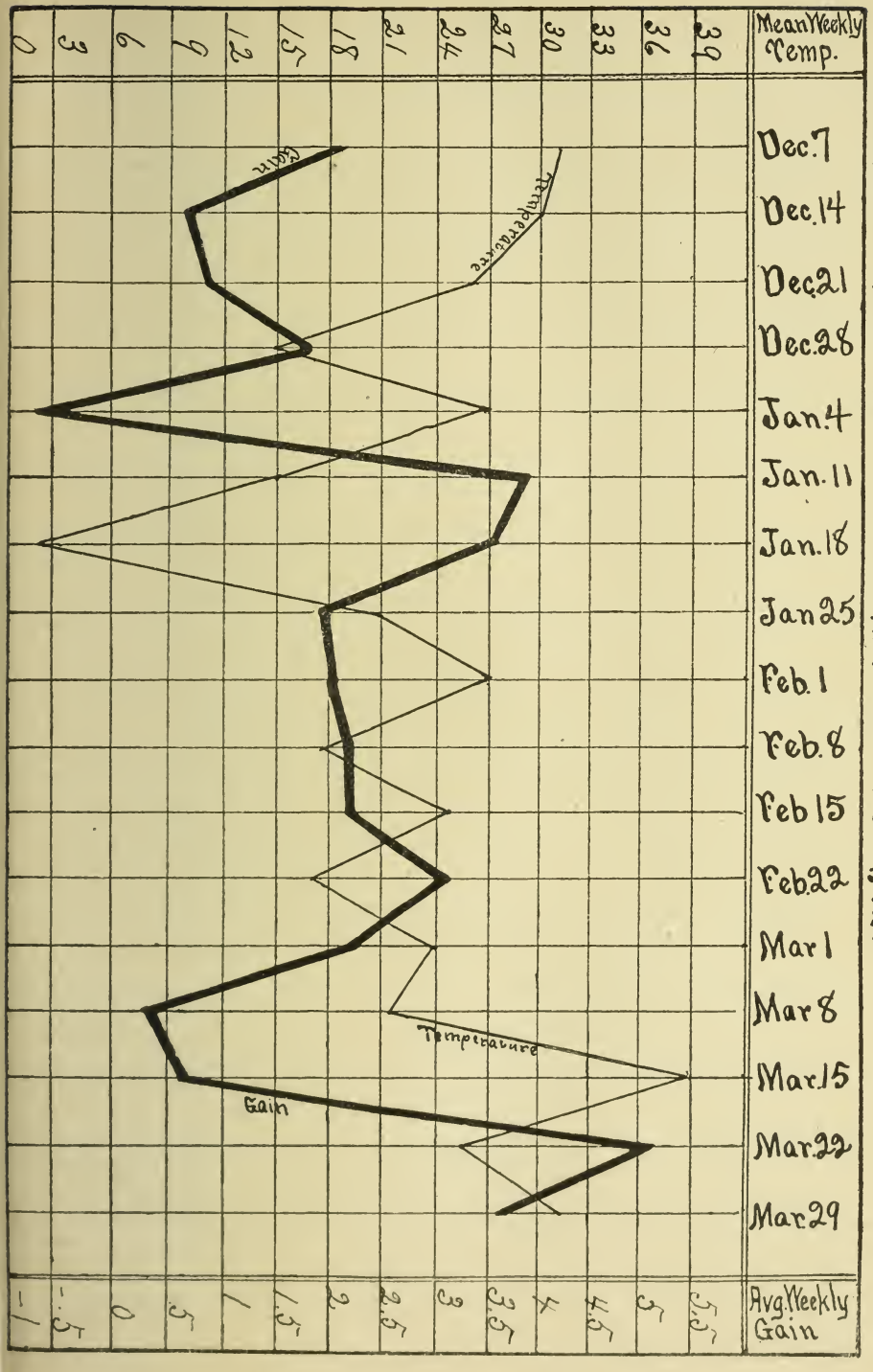


DIAGRAM I RELATION OF TEMPERATURE TO GAIN
Mean Weekly Temp.
39
36
33
30
27
24
21
18
15
12
9
6
3
0
Dec. 7
Dec. 14
Dec. 21
Dec. 28
Jan. 4
Jan. 11
Jan. 18
Jan 25
Feb. 1
Feb. 8
Feb 15
Feb 22
Mar 1
Mar 8
Mar 15
Mar 22
Mar 29
Avg. Weekly Gain
5.0
4.5
4
3.5
3
2.5
2
1.5
1
.5
0
-.5
-1
Gain
Temperature
Temperature
Gain

The average gain by weeks is found by adding the average weekly gain of each lot and dividing by the number of lots. The temperature was compiled from the meteorological report of this station and represents the mean weekly temperature obtained from three daily observations. It will be noticed that in most cases the temperature and gain seem to vary together. Exceptions to this general tendency apparently exist in the weeks ending Dec. 14, Jan. 11, Mar. 8 and Mar. 15. The exception in the week ending Dec. 14 may possibly be accounted for by the fact that the lambs were all dipped on the 3d day of December, and the gains were in all probability somewhat influenced thereby. In the week ending Jan. 4, the lambs were all "off their feed," probably from over feeding, and hence the apparent influence of a rise in temperature is exaggerated.

Whether under different conditions, cold temperatures would be favorable to better gains or not remains to be further investigated.

COMPARISON OF FOODS WITH RESPECT TO COMPOSITION.

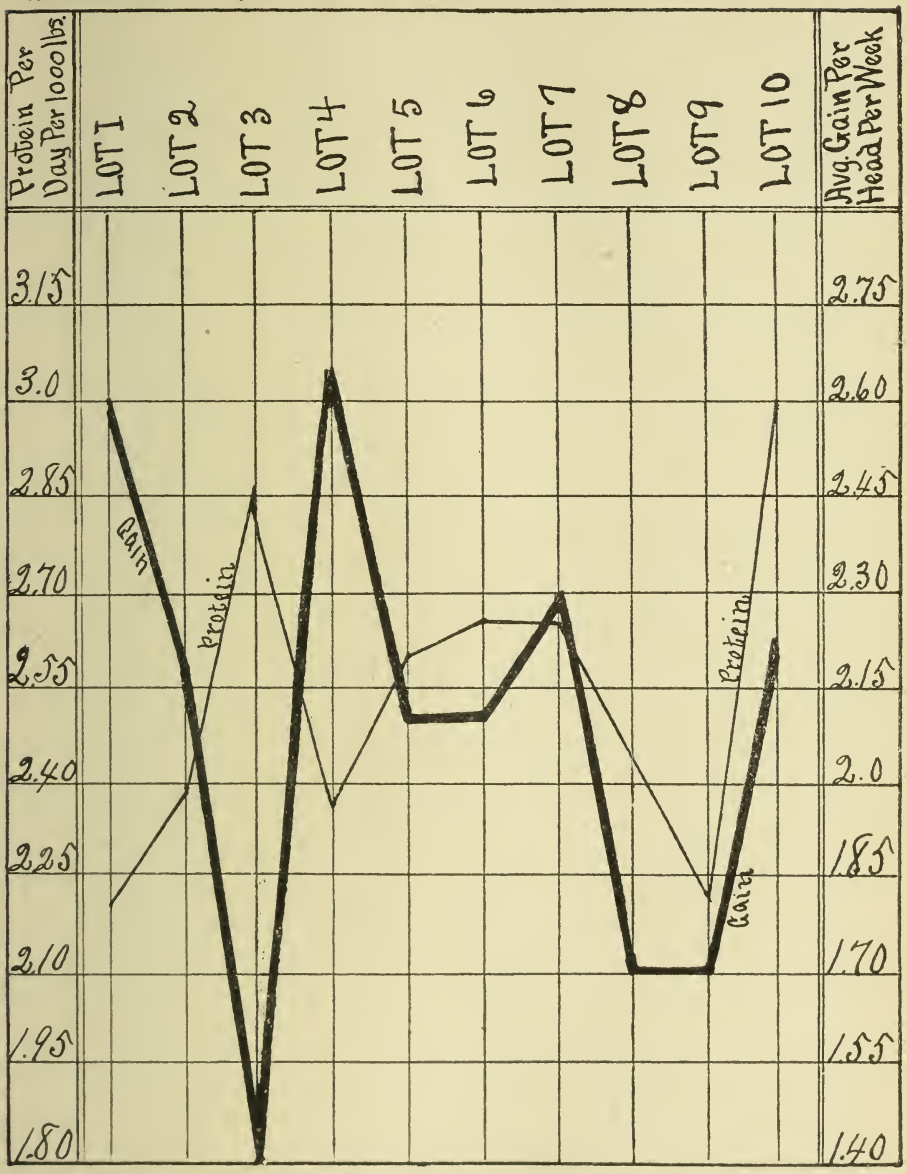
1. RELATION OF PROTEIN TO GAIN.

A great many experiments have been conducted with a view to determining the value of foods from their chemical composition. An exhaustive series of experiments by German chemists, seemed to point to the conclusion that the content of available protein in a food stuff largely determined its feeding value. Many experiments in this country have given credence to this conclusion. Hence it has been taught that the gain depends upon the available protein in the food. The statement is comprehensive, and if true could not fail to be of the utmost practical importance. The experiments recorded in this bulletin were not planned with any reference whatever to the amount of available protein present in the different foods. The comparison was originally intended to be between different rations and their value for fattening lambs. The conditions were made as nearly identical for all the lots as possible with the exception of the kind and quantity of fodder articles. The results therefore should be an index of the comparative value of the rations fed, either because of the protein or other substances contained, or from the specific action of the rations themselves. To determine this point the available protein fed per day in each ration was calculated for each 1000 lbs. live weight. The calculations are made from the German tables and the average composition and digestibility assumed to be the same in the foods used, as those in the tables. To illustrate more clearly to the eye the relation of protein to gain we have prepared the following diagram.

At the top opposite the vertical lines are arranged the lots, while on the left side will be found the number of pounds of protein fed per day to a 1000 lbs. of sheep, live weight; similarly on the right are the average number of pounds gained per head, per week, in each of the lots, for the entire period. The lowest content of protein and the smallest gains are placed opposite at the bottom of the diagram and increase with regular increments toward the top of the diagram.

The heavy black line represents the gain and the lighter line the protein. If the gain depends upon the available protein in the food, the lines should be parallel, or at least tend in the same direction. It will be observed, however, that not only do the lines not run parallel but with few exceptions they tend in an exactly opposite direction.

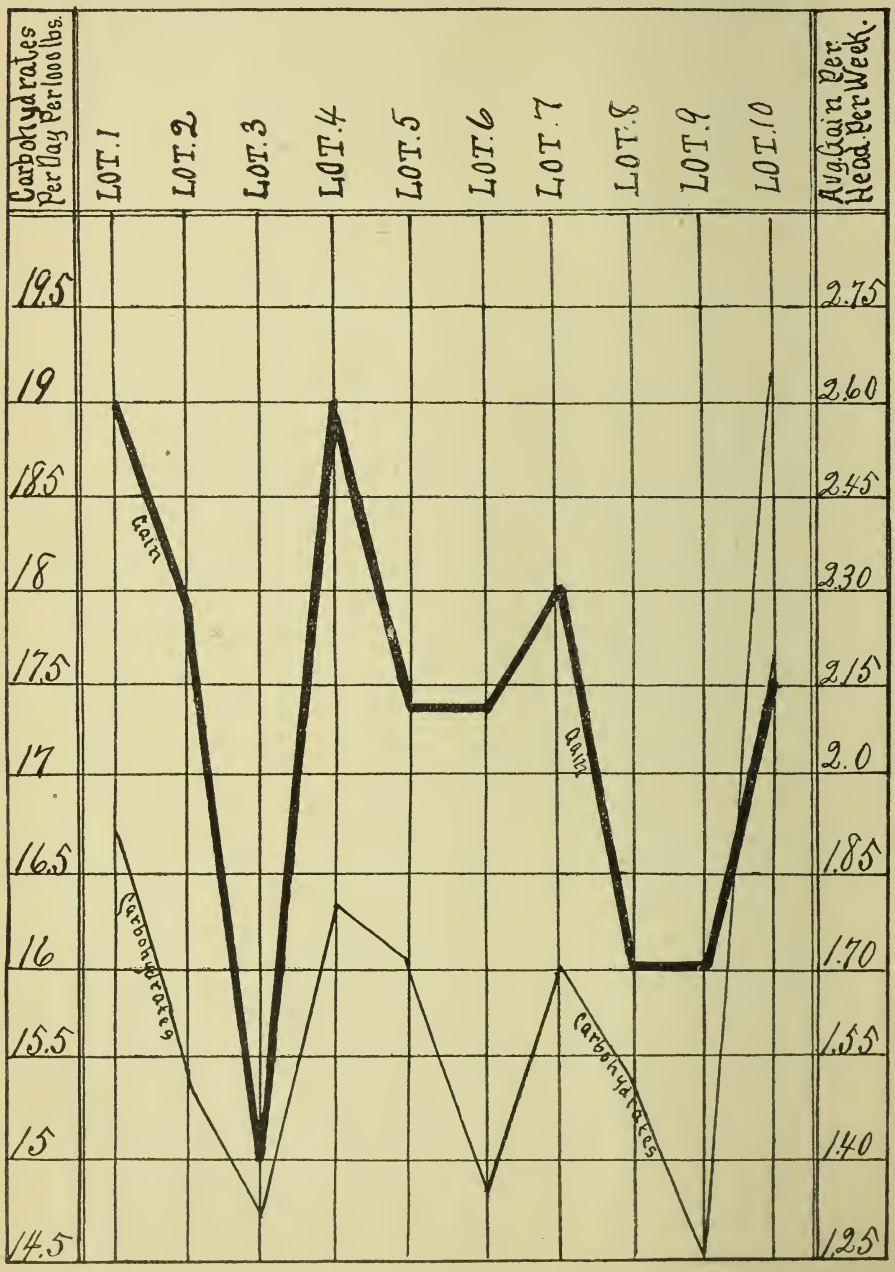
DIAGRAM 2. RELATION OF PROTEIN TO GAIN



Lot 1 which contained the least protein made the greatest gain and in lots 2 and 3 an increase of protein is accompanied by a decreased gain. This is true of all lots except 9 and 10 in which the gain seems to vary with the supply of protein. In lots 6 and 8 an increase in protein does not increase the gain, accordingly. In lot 9 a marked decrease in protein has apparently no tendency to decrease the gain. It would seem there-

fore that we are justified in the inference that in this experiment some other and stronger influence than the supply of protein determined the gains.

DIAGRAM 3 RELATION OF CARBOHYDRATES TO GAIN.



2. RELATION OF CARBOHYDRATES TO GAIN.

Let us study the results still further. The supply of carbohydrates in the fodder rations have often been regarded as of secondary importance. Diagram 2 is arranged precisely like diagram 1 except that the substances included under the term carbohydrates are inserted in place of protein. The diagram illustrates the relation of gain per week to pounds of carbohydrates fed daily per 1,000 lbs. of sheep live weight. The heavy black line represents the gains and the lighter line the carbohydrates. If it is true that the gains bear no direct relation to the supply of carbohydrates then the line should follow no general rule and we should expect more or less irregularity in their relations. It is noticeable, however, that the lines are apparently closely related and vary together. Commencing on the left we notice that a decrease of carbohydrates in lot 2 as compared with lot 1 is followed by a decreased gain; the same is true of lot 3; in lot 4 the increase in carbohydrates is marked, and the gain rises from 1.4 lbs. to 2.6 lbs. per week, and so on through each lot the relation between the supply of carbohydrates and the gain is apparently well defined. In only two cases is there an apparent exception; in lots 6 and 9 a decrease in the carbohydrates is not followed by a decreased gain. We are led to believe that the results obtained cannot be explained by mere coincidence. That ten lots of lambs comprising 125 individuals, fed under precisely similar conditions, except kind and amounts of fodder rations used, should by mere coincidence show such an intimate relation between gain and amount of carbohydrates eaten is scarcely probable. It is interesting at this point to call attention to an experiment by Lawes and Gilbert some years ago in which they investigate the "Comparative feeding value of different foods, according to their composition." One of their conclusions at that time was, "The comparative feeding value of our current stock foods depends more upon the proportion of the digestible non-nitrogenous substances (carbohydrates) they contain than upon their richness in nitrogenous compounds." Many other experiments in this country would also seem to indicate that under certain conditions the gain does not depend solely upon the available protein in the feed. It is possible that experimenters have confined their attention too closely to the consideration of the protein in feed to the exclusion of the carbohydrates. It is a fruitful field for observation and is at least worthy of more careful consideration than it has received.

SUMMARY AND CONCLUSIONS.

1. Lots receiving corn in the grain ration, either in whole or in part, produced the best gains, were apparently in better finish, and in general were fed at a greater profit than the lots receiving bran or oats.

2. A grain ration of bran proved to be an inferior material for fattening lambs.

3. A ration of corn and oats produced slightly better results than either a mixture of corn and bran, or of corn, oats and bran.

4. The results of this experiment indicate that the gains resulting from fattening lambs by means of a "self feed," are produced by a larger consumption of grain for 1 pound of gain, than when fed at regular intervals in the usual manner, and other things being equal the gains are less profitable.

5. A mixture of fodder articles composed largely of a good quality of silage proved a cheap and successful ration for fattening lambs.

6. The rate of gain was apparently increased by shearing during the fattening period.

7. In this experiment colder temperatures were quite generally accompanied by increased gains.

8. The amount of available protein in the various rations was apparently a less potent factor in producing gains than the amount of available corbohydrates.

9. Small gains are not necessarily unprofitable nor are large gains a sure index of profitable food consumption.

POTATOES AND THE POTATO SCAB.

BY L. R. TAFT AND R. J. CORYELL.

Potato raising is an industry in which the State of Michigan is largely interested, growing an annual crop of from ten to fifteen million bushels, with an average yield per acre, from 1880 to 1891, inclusive, of 91 bushels. For the same time the Detroit prices in car load lots averaged 45 cents per bushel.

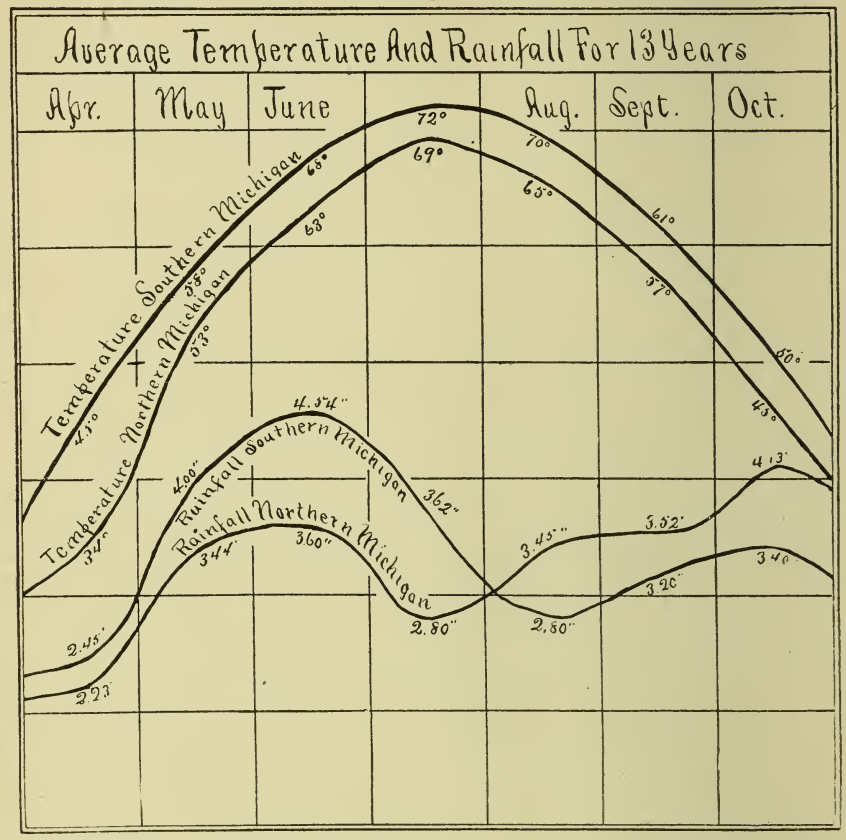
Because of its importance, this Station has given the potato crop a considerable amount of attention. The evident appreciation of our experiments by the potato raisers is a sufficient reason for some general suggestions that are here introduced.

The potato crop matures in a comparative short time, and to produce an abundant yield a large amount of plant food must be readily available—more in proportion to the quantity utilized by the plant than is required by any other farm crop raised in Michigan. Coarse manure or stiff sod, though they may contain an abundance of plant food, are unsuitable for the potato, as they decompose slowly, and the crop suffers because it cannot obtain a ready supply of nourishment. A lack of fertility or of moisture, especially at the time the tubers are developing, must seriously affect the yield, as the tubers make their entire growth in a period of from four to six weeks. But little substance is stored up in the vines for the future use of the tubers, and most of the material must come directly from the soil. Hence the necessity for having the manure well rotted, or the fertilizers soluble; of having the soil mellow and pulverized to allow the free and easy penetration of the roots to absorb the fertility, and of having a sufficient amount of moisture to dissolve the plant food.

During the summer a drought generally occurs, but thorough and repeated cultivation will do much to husband the moisture and carry the vines through this period. Should the drought be severe, or come when the tubers are developing rapidly, a shortened crop must be the result.

An examination of the rainfall record of the State shows that the drought comes regularly, although it varies in different parts of the State. With the view of determining the best date for planting, so that the tuber-forming period will not come at the time of the least rainfall, a table of

FIG. 1.—RAINFALL AND TEMPERATURE CHART.



rainfall and temperature is given. That portion of the State designated on the chart as *Southern Michigan* consists of the three southern tiers of counties. The part called *Northern Michigan* consists of those counties in the lower peninsula north of the southern line of Muskegon, Montcalm, Gratiot, Saginaw, Tuscola and Sanilac. The rainfall of the counties that border on the lakes is greater than in the interior. The counties on Lake Michigan have a greater rainfall than those on Lake Huron, while the Grand Traverse region is especially favored.

In the southern part of the State it is the general practice to plant potatoes after getting in the corn, or about the 20th of May. Potatoes planted at this time will form tubers in August, at the time of the least rainfall and the greatest heat, or under the most unfavorable conditions. If the planting is done either earlier or later it would be more favorable; if earlier, it should be done as early as possible, and it can be done early

in April on many soils. The copious June rains will furnish abundant moisture at the time when most needed, even though the July precipitation be less than the normal. A medium early variety should be used in this case.

Generally, better results can be obtained by using the second alternative —planting later. By plowing early in May and keeping the ground well cultivated, the moisture from the spring rains can be retained, and an ideal seed bed secured. If we plant early in June, the ground being warm, the seed will vegetate quickly and the June rains will cause a rapid growth. The great need of moisture will not come until September, when there is an increase in precipitation and a lower temperature. That the late varieties of potatoes are better for this late planting, the results this year, in our variety tests, well illustrate. The planting was done from the 6th to the 8th of June, and while the drought killed the early varieties in from 58 to 65 days from planting and the crop was nearly a failure, the late varieties ripened in from 85 to 120 days, with a satisfactory yield.

In northern Michigan the drought comes in July, at a time when it will do the least harm to the potato grower. The line representing the rainfall for August and September, while not indicating a large precipitation, shows by its evenness that it is quite reliable. This condition with 5° to 8° lower temperature may in part explain why the northern portion of the State is so successful in potato growing. The average yield per acre in that part of the State is a fraction over 100 bushels per acre, while in southern Michigan it is about 82 bushels.

TESTS OF VARIETIES.

There were 174 varieties tested this season. The soil was a clay loam and for the previous two years was in strawberries. It was plowed in the fall, and in the spring about twenty-five loads of compost per acre were added and the land again plowed. The planting was done on the 6th, 7th and 8th of June. The manner of planting was as in previous years.

The growth was very vigorous until August 1, when began a period of two weeks of very dry weather, accompanied by strong hot winds. The early varieties were attacked by a leaf blight, which is treated briefly later on in this bulletin, and which, with the heat, killed many of them, so that the yield was unsatisfactory and consisted mostly of small potatoes. The drought affected the mid-season varieties to some extent, but the late varieties were only slightly, if at all, injured. The vines of many of the latter remained green until killed by frost on the 27th of September.

In examining the table, one must bear in mind the unfavorable conditions under which the early varieties were grown. The date of ripening, yield and cooking qualities were all affected. Many of the later varieties that show a large per cent of small tubers, would be quite desirable kinds in a more favorable season. Several of the varieties that were tried for the first time in 1892 have a poor average, although they gave large yields the past season. More credence should be given to the yield of 1893 than that of the previous year, for then the conditions were particularly unfavorable.

The "Manner of Growth" is indicated by the following abbreviations: "up" upright; "m" medium, "sp" spreading.

In the columns indicating the cooking qualities, the varieties are marked from 1 to 10. Below 7 is very poor, 7 poor, 8 fair, 9 good, 10 best. Many varieties stand low because of premature ripening.

Variety.	Height of vines.	Manner of growth.	Date of maturity.	Yield.				No. of years for which the average is taken.	Cooking qualities.			Remarks.
				Large.	Small.	Total.	Average.		Flavor.	Dryness.	Color.	
Alaska	20	up	Sept. 20	59.8	22.9	82.8	149	5	8	7	10	
Albino	17	"	Aug. 16	52.2	48.2	100.4	126	4	8	8	9	
Alexander Prolific	24	sp	Sept. 30	139.8	35.6	175.4	175	1	10	8	9	
American Giant	14	"	" 24	80.1	41.4	121.5	121	1	9	7	8	Quite apt to be coarse.
American Wonder	28	up	" 23	353.8	51.8	405.6	224	2	9	8	9	Succeeding everywhere.
Arizona	22	m	" 25	117.4	90.1	207.5	132	4	10	10	9	
Badger State	18	sp	" 22	79.2	22.5	101.7	73	5	7	8	7	
Bannock	23	up	" 27	126.9	90 7	217.6	212	5	9	9	9	Reliable.
Barstow	24	m	" 1	107.5	82	189.5	170	3				
Beauty of Hebron	25	up	Aug. 26	174.2	72.1	246.3	175	5	9	8	9	
Bill Nye	24	"	Sept. 28	124.4	79.2	203.6	126	2	8	7	8	
J. G. Blaine	22	sp	" 4	91.3	60.5	151.8	117	3	8	8	7	
Blue Mayflower	26	up	" 30	108.5	44 3	152.8	121	2	8	8	9	
Boley Northern Spy	24	m	" 30	101.6	59.4	161	132	3				
Bonanza	26	up	" 5	225.2	55.4	280.6	160	3	10	9	9	
Boston	20	sp	" 20	60.5	61.6	122.1	130	2	10	9	8	
Brownell Best	24	up	" 26	116.4	98	214.4	175	4				
Brownell Winner	26	m	Oct. 5	129.8	57.1	186.9	160	4	8	9	8	
Burbank	23	m	Sept. 25	103.4	69.3	172.7	178	1	8	8	9	
Burpee Extra Early	19	sp	Aug. 12*	55	80.5	135.5	127	4	6	7	7	
Carpenter	14	m	Sept. 1	57.9	36.8	94.7	93	2	9	10	9	
Cayuga	26	sp	" 24	159.6	26.1	185.7	104	2				Tubers large, white, even size.
Chas. Downing	18	"	" 6	69.3	26.6	95.9	81	2	7	7	9	
Chautauqua	24	"	" 13	171.2	47.4	218.6	201	3	8	8	6	Very desirable. Tubers oblong, pink.
Chicago Market	20	"	" 10	99.5	65.3	164.8	165	1	9	9	9	Largely planted, lacks productiveness.
Clark No. 1	22	m	" 14	129.4	44.7	174.1	187	6	8	8	9	
College No. 67	23	"	" 20	135.6	52	187.6	102	2	8	9	9	
Columbian Rose	24	sp	Oct. 1	222.5	136.1	358.6	359	1	9	8	8	From V. D. Stoneroad, Lewiston, Pa.
Copper Mine	24	m	" 5	167.8	61.8	229.6	208	5	9	8	9	Reliable. Tubers pink, oval, flattened.
Cream City	18	up	Aug. 22*	57.9	42.1	100	115	2	10	9	10	
Cream of the Field	22	sp	Sept. 26	188.9	42.3	231.2	160	3	9	8	8	Very desirable. Tubers buff, oval.
Crown Jewell	25	"	" 1	125.9	44.5	170.4	177	3				
Dakota Red	25	up	Oct. 5	183.6	51.6	235.2	247	5	10	10	9	Very productive. Tubers coarse, poor color.
Delaware	24	sp	Sept. 25	125.3	37.4	162.7	140	3	10	9	10	
Early Harvest	25	"	" 1	89.5	142.8	232.3	193	5	9	9	9	Too many tubers for most years.

Early Maine	21	up	Aug. 25*	96.8	81.6	178.4	140	5	7	8	8	
" May	24	m	" 18*	159	81.2	240.2	240	1	----	----	----	
" Mayflower	24	up	Sept. 18	127.8	48.1	175.9	132	3	8	9	8	
" Minnesota	24	sp	Aug. 8	102.8	94.4	197.2	182	3	7	7	9	
" Norther	22	"	Sept. 1	137.6	63.3	200.9	201	1	10	9	8	
" Oxford	24	sp	Aug. 15*	143.7	113.4	257.1	228	5	10	9	10	One of the very best early varieties.
" Pearl	26	up	Sept. 10	155.3	70.1	225.4	214	4	8	7	8	A good medium-season kind.
" Rose	28	sp	Aug. 24*	80.6	134.4	215	203	4	8	8	9	
" Six Week Market	20	up	" 6*	128	43	171	168	3	8	8	9	Best of the very early. Killed by heat.
" Sunrise	18	"	Sept. 1	78.8	52.9	131.7	132	1	9	9	9	
" Telephone	22	sp	" 25	101	84.7	185.7	186	1	----	----	----	
" Vermont	20	m	" 25	126.7	82	208.7	225	4	6	7	6	A good late variety.
" Wisconsin	24	up	Aug. 24	114.2	44.8	159	106	2	10	9	10	
Empire State	25	m	Oct. 5	176.2	35.3	211.5	186	5	10	9	8	
Everitt	24	sp	Sept. 20	92.6	77.1	169.7	193	4	----	----	----	
Excelsior	16	m	Aug. 8*	89.6	77.8	167.4	190	5	7	5	9	
Extra Keeper	20	sp	Sept. 20	47.6	38	85.6	86	1	7	7	9	
Farina	25	"	Aug. 26	85.4	120.3	205.7	144	3	10	10	9	
Fausts 1889	20	m	" 15*	33.4	91.6	125	164	3	8	7	8	Blights badly.
Fearnaught	26	up	Sept. 25	229.9	60.5	290.4	197	3	9	9	9	Tubers long, light colored, even size.
Feek Extra Early	13	m	Aug. 15*	128.9	49	177.9	161	3	8	8	9	
Fillbasket	24	sp	Sept. 10	154.9	86.5	241.4	174	2	----	----	----	Tubers light colored, oblong, flattened.
Ft. Collins No. 88	20	"	Aug. 18*	84.7	75.6	160.3	180	4	8	8	7	
Freeman	24	up	Sept. 20	171.4	57.6	229	216	3	10	9	10	Desirable.
Gardner's Early	16	m	Aug. 4*	42.9	98.3	141.2	148	5	9	8	9	Too easily affected by heat or blight.
Genesee Co. King	25	up	Sept. 28	166.4	108.6	275	192	2	----	----	----	Sets too heavy. Needs best conditions.
Gov. Rusk	25	m	" 20	190.3	51.7	242	182	2	8	8	7	Tubers oval, even size.
Green Mountain	24	up	" 25	149.6	52.1	201.7	132	4	----	----	----	
Gregory No. 1	24	sp	" 1	85.7	49.2	134.9	190	5	9	8	9	Reliable mid-season variety.
" " 2	21	"	" 22	113	58.8	171.8	149	4	----	----	----	
Halo of Dakota	26	up	" 25	268.6	25.8	294.4	241	3	10	10	8	One of the very best late varieties.
Hampden Beauty	24	m	Aug. 20	117.2	60.5	177.7	140	3	7	8	9	Blights badly.
Harbinger	21	up	Sept. 1	46.6	122.8	169.4	109	4	7	6	9	
Hicks No. 9	24	m	" 1	43.6	72.6	116.2	113	2	9	10	10	From D. C. Hicks, N. Clarendon, Vt.
" " 12	18	m	Aug. 16	109.8	89.5	199.3	192	2	8	6	8	A promising early variety.
" " 22	23	up	Sept. 10	131	75.7	206.7	143	2	8	8	9	
" " 81	27	m	" 18	218.6	34.4	253	198	2	7	7	9	Valuable, but tubers somewhat irregular.
" " 101	24	sp	" 25	223.2	35.3	258.5	196	2	9	9	8	Most desirable of his seedlings.
Hoadley	19	up	Aug. 16	59.4	73.4	132.8	112	2	8	9	9	
Hoffman	22	sp	Sept. 27	47.3	88.2	135.5	113	2	9	9	8	
Ideal	25	up	" 25	116.6	64.2	180.8	168	5	8	8	8	
Imperator	26	up	Oct. 5	207.3	100.2	307.5	178	4	9	8	9	
Ionia	23	sp	Sept. 15	79.1	38.4	117.5	80	3	7	6	8	
Iowa Beauty	16	"	Aug. 19	61	103.4	164.4	183	3	9	8	9	Blighted. Good color and form.
Iron Clad	25	"	Sept. 15	117.2	77.3	194.5	152	2	7	7	9	

* Killed by heat and blight.

POTATOES, TABLE OF VARIETIES.—*Continued.*

Variety.	Height of vines.	Manner of growth.	Date of maturity.	Yield.				No. of years for which the average is taken.	Cooking qualities.			Remarks.
				Large.	Small.	Total.	Average.		Flavor.	Dryness.	Color.	
Joe Davis	25	up	Sept. 27	122	86.8	208.8	208	1	8	8	8	
June Eating	19	m	Aug. 9*	155	103.3	258.3	216	4	---	---	---	Desirable for first early.
Late Puritan	23	"	Sept. 24	111.3	55	166.3	122	2	10	9	10	
Lazell Seedling	24	"	" 30	139.8	35.6	175.4	211	3	8	8	9	
Leather Coat	18	"	" 1	100	58.5	158.5	185	4	10	10	9	
Lee Favorite	20	up	Aug. 23	66.5	95.2	161.7	210	5	10	10	9	Done poorly for last two seasons.
Mammoth Pearl	24	sp	Sept. 26	256	43	299	299	1	10	10	8	One of the best on the Farm Department.
Matchless	18	"	" 19	82.8	81.6	164.4	132	5	8	8	10	
McFadden Earliest	24	"	Aug. 10*	112	80	192.8	182	3	7	8	7	Desirable for early.
Minister	18	up	Sept. 11	38.7	60.5	99.2	96	4	9	9	8	
Minn. Seed No. 18	18	m	Aug. 8*	25.2	91.7	116.9	93	2	7	7	8	From S. Frogner, Herman, Minn.
" " " 50	25	up	Sept. 14	83.2	57	140.2	158	2	10	10	9	
" " " 64	24	m	" 1	89.4	136.8	226.2	147	2	8	7	8	Oblong, rose colored.
" " " 187	22	sp	" 20	90.9	59.9	150.8	110	2	---	---	---	
" " " 188	16	up	Aug. 20	57.8	48.1	105.9	180	2	8	8	10	
" " " 189	26	sp	" 28	162	42	204	166	2	10	9	10	
" " " 190	20	up	Sept. 7	124.8	61.2	186	165	2	9	9	8	
Mitchell Seedling	25	sp	" 25	178	68	246	176	3	10	10	10	
Monroe Seedling	26	up	" 25	132	79.2	211.2	206	3	7	7	10	Sets many tubers. Needs rich soil.
Morning Star	18	sp	" 4	65.2	110.5	175.7	149	3	---	---	---	
Mrs. Cleveland	20	"	Aug. 25	72.2	53.2	125.4	200	3	8	8	7	Blights this year. Generally productive.
Mulla	25	"	Sept. 25	218.8	47.4	266.2	150	2	9	8	10	Promising. Tubers buff, round, uniform.
New Queen	23	"	Aug. 16*	132.6	65.8	198.4	195	3	7	8	9	Valuable for early. Tubers white.
New Zealand	16	m	" 25	68.5	68.4	136.9	109	3	8	8	8	
Nott Victor	28	up	Sept. 12	233.9	59	292.9	208	3	9	9	9	Desirable. Tubers long, large, pink.
O. K. Mammoth	20	"	" 24	124.5	63.9	188.4	149	3	8	8	9	
Ohio, Jr.	22	"	Aug. 12*	43.8	100.2	144	119	3	8	8	8	
On Top	24	sp	Sept. 25	153	72.8	225.8	158	2	8	9	8	Tubers medium size, round, pink.
Osceola Mammoth	18	up	" 1	47	38.7	85.7	97	2	10	9	9	
Paris Rose	24	m	" 1	139.2	118	257.2	179	2	9	9	10	Valuable in moist, rich soil.
Park Region	24	up	" 10	125.5	65	190.5	190	1	9	9	10	Tubers large, buff, oval.
Peach Blow	28	"	Oct. 1	83.5	35.1	118.6	119	1	8	7	8	Worthless now.
Pearl of Savoy	25	"	Sept. 1	90.2	124	214.2	176	2	7	7	8	
Peoples	18	sp	" 15	65.9	60.5	126.4	136	3	7	6	8	
Perfection	22	up	" 1	59	86.7	145.7	163	3	7	7	8	

Polaris	18	"	Aug. 16	68.8	81.2	150	140	6	9	9	9	
Pres. Lincoln	23	m	Sept. 30	158.5	78.3	236.8	224	5	8	8	8	Desirable in all points except color—red.
Putnam Beauty	22	sp	" 8	104.8	41.4	146.2	108	5	8	8	9	
" Early	18	m	Aug. 10*	37.5	118	155.5	204	5	---	---	---	Set too many tubers for this season.
" Select	24	up	Sept. 25	52.8	73	125.8	153	5	9	9	8	
Queen (New)	24	sp	Aug. 20	110.9	75.6	186.5	230	3	9	7	9	
Queen of Paris	24	up	Sept. 1	127.2	81.3	208.5	257	3	9	9	9	Heretofore has been our best variety.
Queen of the Valley	24	sp	" 1	100.8	80.7	181.5	146	4	8	8	8	
Randall Beauty	25	up	Aug. 14	61.7	141.2	202.9	176	5	7	6	7	
Red Star	26	m	Sept. 20	148.1	43.8	191.9	154	4	9	10	9	
Restaurant	24	sp	" 28	128.8	79.8	208.6	124	2	8	7	9	
Rochester Favorite	24	up	" 20	169.6	56.7	226.3	202	5	8	9	9	
Rogers Seedling	22	"	" 26	105.2	81.7	186.9	201	2	9	10	9	
Rose 74	24	"	" 22	114	27	141	184	3	9	9	10	
Rural Blush	22	m	" 1	127.5	129	256.5	224	4	7	8	8	Valuable for the richest soil.
Rural New Yorker No. 2	30	v up	" 22	185.7	33.6	219.3	139	4	8	7	9	Better than this record shows.
Salzer Earliest	22	up	Aug. 13	55.3	124.5	179.8	157	2	7	6	7	Sets too many tubers.
Seneca Beauty	22	sp	Oct. 1	154.8	56	210.8	211	1	9	10	9	Tubers red, oval.
Signal	23	m	Sept. 1	112.7	99.7	212.4	223	3	7	6	7	Valuable for mid-season.
Snow Queen	20	sp	" 10	63.7	122.9	186.6	136	3	8	8	9	
Stanley	22	up	" 1	195.6	67.8	263.4	173	2	9	8	8	
Star Russet	26	sp	" 25	101.3	83.2	184.5	154	3	8	8	9	
Stoneroad Main Crop No. 1	26	"	Oct. 1	136.1	30.3	166.4	166	1	9	8	7	Tubers uniform, light colored.
" " " " 2	24	"	Sept. 24	152	24.5	176.5	176	1	---	---	---	From V. D. Stoneroad.
Storr Seedling	26	"	Oct. 3	134	60	194	164	2	7	8	9	
Strong Alpha	14	up	Sept. 25	67.7	59.7	127.4	127	1	8	7	8	
Summit	27	m	" 20	189	61.7	250.7	254	4	9	8	9	Most productive variety here tested.
Sunlit Star	21	"	" 1	77.1	92.3	169.4	162	3	7	7	8	
Superior	26	up	" 20	74.9	57.1	132	153	4	9	8	9	
Supplanter	24	"	" 10	111.1	107.1	218.2	220	3	8	8	9	Tubers smaller than usual.
Sylvan	26	"	" 25	137.5	79.6	217.1	142	3	10	10	9	
Thorburn	28	"	" 24	188.4	115.7	304.1	224	5	10	10	9	One of the best. Needs good conditions.
Thunderbolt	26	m	" 25	163.6	59.3	222.9	140	3	9	10	9	
Timpes No. 2	26	up	" 26	103.6	65.7	169.3	156	3	8	8	7	
" " 4	22	m	" 22	112.6	53.4	166	186	3	8	7	9	
" " 5	24	up	" 1	132.1	132.6	264.7	173	3	8	9	8	
" " 6	24	sp	Aug. 24	120.6	56.4	177	167	3	7	8	8	
" " 9	24	up	Sept. 26	184.1	96.4	180.4	109	3	8	9	10	
Tonhocks	22	"	Aug. 15*	93.1	90.3	183.4	191	3	7	7	9	
Umpire	23	"	Oct. 2	116.7	62.6	179.3	192	3	9	8	9	
Vaughan	22	sp	Sept. 16	99	49 5	148.5	148	1	9	8	8	
Vaughan White Prize	24	up	" 30	179.6	19.6	199.2	199	1	10	10	9	Tubers very uniform, light colored.
Vanguard	24	sp	" 2	191.6	39.7	231.3	149	2	8	7	8	A promising variety.
Vick Champion	22	"	Oct. 6	204.2	80	284.2	208	2	10	9	10	Tubers large, light colored, desirable.
" Early Market	26	up	Aug. 15*	151.8	42.4	194.2	194	1	8	8	8	

* Killed by heat and blight.

POTATOES, TABLE OF VARIETIES.—*Continued.*

Variety.	Height of vines.	Manner of growth.	Date of maturity.	Yield.				No. of years for which the average is taken.	Cooking qualities.			Remarks.
				Large.	Small.	Total.	Average.		Flavor.	Dryness.	Color.	
Wall Orange	19	up	Sept. 26	108	95.4	203.4	140	3				
Watson Seedling	24	m	" 20	125.5	94.1	219.6	179	3	10	9	10	
Way	28	up	" 24	174.6	78.4	253	186	3	8	8	8	
West No. 1	20	sp	Aug. 14*	68.9	69.5	138.4	157	3	7	6	8	
" " 2	22	"	" 15*	105.9	73.2	179.1	100	3	6	5	5	
" " 3	20	up	" 25*	66.4	68.6	135	180	3	9	9	7	
White Beauty of Hebron	18	sp	Sept. 20	179.2	51.4	230.6	231	1	9	9	9	
White Chief	19	"	" 18	79.2	73.1	152.3	124	2	10	9	10	
White Elephant	24	up	Oct. 3	226.9	62.5	289.4	205	3	9	8	8	Still one of the best.
White Flower	28	"	Sept. 20	169.9	30.2	200.1	165	3	8	9	8	
White Star	24	"	" 26	79.5	90.5	170	163	3	9	10	9	
Wixom Seedling	22	sp	" 20	73.3	77.4	150.7	125	4	7	6	10	
Wolverine Beauty	24	up	" 25	178.4	28.9	207.6	207	1	9	10	10	
Woodbury White	27	"	" 26	231.1	73.1	304.2	304	1	10	10	9	
World's Fair	25	v sp	" 30	278.7	51.7	330.4	330	1	10	10	10	

* Killed by heat and blight.

DESCRIPTIONS OF THE MORE PROMISING NEW VARIETIES.

Many varieties in the preceding table, tried by this department for the first time, were turned over by the Farm Department. They were treated in Bulletin No. 95.

Columbian Rose.—V. D. Stoneroad, Lewiston, Pa. This is a very promising variety. The vines are strong and vigorous, rather spreading. Tubers are medium size and uniform; form round and somewhat irregular; color rose.

Early May.—R. C. Barless, Rose, N. Y. An early variety of some promise. It did not reach maturity because of the drought and heat.

Stoneroad Main Crop Nos. 1 and 2.—These are seedlings from the above-named person. The vines are fairly good growers. The tubers are of good appearance, light colored, oblong with few shallow eyes. They resemble each other closely.

Early Norther.—V. D. Stoneroad. It was somewhat affected by leaf-blight, but it matured its crop. It is said to be a seedling of the *Early Rose.* In color it is darker than the parent, but about the same form. Season medium early.

Vaughan White Prize and *World's Fair.*—J. C. Vaughan, Chicago, Ill. These varieties are just alike in appearance and in season. They are medium size; skin netted; color much like the *Beauty of Hebron*; form round, irregular. The *World's Fair* is very productive.

Wolverine Beauty.—S. J. Youngman, Lakeview, Mich. A white, oblong, flattened potato, recommended as scab proof. They have very thick, russet skin. Only 8 per cent were scabby, which was a small number compared with many of the varieties.

VARIETIES RECOMMENDED.

The table shows very clearly the standing of the various varieties, but it may be desirable to give a short list here of the well tried sorts that are known to be reliable.

VERY EARLY.

Early Six Weeks' Market, Gardner Early and *June Eating.*

EARLY.

The following varieties are a little later than the previous class, better yielders and not so easily injured by adverse weather: *Early Oxford, Lee Favorite, McFadden Earliest, Queen, Paris Rose.*

MEDIUM.

Chautauqua, Early Pearl, Fillbasket, Freeman, Nott Victor, Queen of Paris, Signal, Supplanter, Rural Blush and *Thorburn.*

LATE.

Those marked with an asterisk (*) are especially reliable: *American Wonder**, *Bannock*, *Copper Mine*, *Dakota Red*, *Halo of Dakota**, *Hicks 81* and *101*, *Mulla*, *President Lincoln**, *Rochester Favorite*, *Rural New Yorker No. 2**, *Summit**, *Vick Champion*, *White Elephant* and *Woodbury White*.

POTATO SCAB.

Quite extensive experiments were carried on in seeking methods of checking this disease. It had already been quite thoroughly established that *corrosive sublimate* and *Bordeaux mixture* in the order named were the best fungicides with which to combat the scab. Our investigations were carried on for the purpose of finding the best strength and the proper length of time for soaking the seed.

In treating with corrosive sublimate, three strengths of the solution were used—1 part corrosive sublimate to 750 parts of water, 1 part to 1,000 and 1 part to 2,000. This is equal to 1 oz. of corrosive sublimate to nearly 6 gal. of water, 1 oz. to $7\frac{3}{4}$ gals. and 1 oz. to $15\frac{5}{8}$ gals. The potatoes that were used for seed were soaked in these solutions for lengths of time varying from a few minutes to eight hours.

Two varieties of potatoes were used for each experiment—the O. K. Mammoth and the early Ohio. The seed of the former was very scabby (Fig. 2), so much so that the potatoes would not be salable. The scab spots on the Early Ohio were neither numerous nor deep enough to hurt their sale in any market. After the seed was removed from the solution it was placed in new paper bags, which prevented any contamination from crates or baskets.

The soil was a very uniform clay loam. It had been yearly cropped with garden vegetables for about twenty years, and received an annual dressing of compost for most of that time. No potatoes had been grown on it for at least six years, and probably longer.

The plots were arranged in sections which were two rods long and wide enough for fourteen rows of potatoes. For each row two pounds of seed was used, making twenty-five hills. Two rows in each plot were untreated. Next to these rows came the row that was treated for the shortest length of time, the arrangement of the rows in the field being the same as in the tables. The sections were placed end to end, and the cultivation was north and south, passing from one section to another. The planting was done on June 10.

FIELD PLAN OF THE SCAB EXPERIMENTS.

South.	1	2	3	4	5	6	7	North.
	O. K. Mammoth.	O. K. Mammoth.	Early Ohio.	O. K. Mammoth.	Early Ohio.	Bordeaux. Rural New Yorker No. 2.		
	1-750	1-1,000	1-1,000	1-2,000	1-2,000	1,000 lbs. fertilizer per acre.	2,000 lbs. fertilizer per acre.	

Fig. 2. The Seed Used in the Test.

RESULTS WITH 1 TO 750 TREATMENT.

SECTION 1.

Variety.	Treatment.	Length of time in solution.	Yield per acre.	Per cent scabby.
O. K. Mammoth	untreated		137.5	54.3
Early Ohio	"		101.5	63
O. K. Mammoth	1-750	5 min.	108.3	9
" "	"	10 "	112	11
" "	"	¼ hour	96.8	10.5
" "	"	½ "	100	9.6
" "	"	¾ "	116.1	7.3
" "	"	1 "	122.2	5
" "	"	1¼ "	114.6	7
" "	"	1½ "	112	7.3
" "	"	1¾ "	129.4	7.6
" "	"	2 "	94	4
" "	"	2½ "	134.8	10
Average of the treated plots			112.7	8

No definite information was gained from this section except that the treatment was fairly successful, and that the seed treated the longer length of time was slower in sprouting.

RESULTS WITH 1-1,000 TREATMENT.

SECTION 2.

Variety.	Treatment.	Length of treatment.	Yield per acre.	Per cent scabby.
O. K. Mammoth	untreated		145	63
Early Ohio	"		97	68
O. K. Mammoth	1-1,000	¼ hour	159.1	8
" "	"	½ "	111.3	3
" "	"	¾ "	135.6	5
" "	"	1 "	103.3	4½
" "	"	1¼ "	118	10
" "	"	1½ "	134	2
" "	"	1¾ "	137	2
" "	"	2 "	102	3
" "	"	2¼ "	91.9	2
" "	"	2½ "	98	5
" "	"	3 "	102	5
" "	"	4 "	107	5
Average of the treated plots			116.6	4.5

SECTION 3.

Variety.	Treatment.	Length of treatment.	Yield per acre.	Per cent scabby.
O. K. Mam'oth	untreated		152.8	69
Early Ohio	"		139.7	69
" "	1-1,000	¼ hour	133.3	31
" "	"	½ "	152.8	34
" "	"	¾ "	126	34
" "	"	1 "	131	25
" "	"	1¼ "	157.8	13
" "	"	1½ "	124	7
" "	"	1¾ "	149.3	17
" "	"	2 "	143	17
" "	"	2¼ "	138.4	8
" "	"	2½ "	131.5	5
" "	"	3 "	108.2	3
" "	"	4 "	109.6	4
Average of the treated plots			133.7	16.5

A study of the treatment of the 1 to the 1,000 solution on the two varieties indicates three things,—that the scab decreases as the length of the treatment increases, as also does the yield, and that the *Early Ohio* is more subject to the scab than the *O. K. Mammoth*. The former has a thin skin, while the skin of the latter is very thick. It is possible that the thick skin prevents the entrance of the germs.

RESULTS WITH 1-2,000 TREATMENT.

Section 4.					Section 5.				
Variety.	Treatment.	Length of treatment.	Yield per acre.	Per cent scabby.	Variety.	Treatment.	Length of treatment.	Yield per acre.	Per cent scabby.
O. K. Mammoth	untreated	----------	72.5	34	Early Ohio	untreated	----------	126.3	76
" "	"	----------	106.3	32	" "	"	----------	114.7	68
" "	1-2,000	½ hour	110	4	" "	1-2,000	½ hour	139.4	11
" "	"	1 "	111.5	6	" "	"	1 "	131.5	34
" "	"	1½ "	91.6	5	" "	"	1½ "	148.4	4
" "	"	2 "	99	3½	" "	"	2 "	123.6	15½
" "	"	2½ "	93.7	3	" "	"	2½ "	155.4	14
" "	"	3 "	105.2	2	" "	"	3 "	116.5	7
" "	"	3½ "	102.5	1	" "	"	3½ "	112.5	14
" "	"	4 "	130	1	" "	"	4 "	143.5	4
" "	"	5 "	106.6	2	" "	"	5 "	129.1	7½
" "	"	6 "	107.8	5	" "	"	6 "	154.8	3
" "	"	8 "	149.8	1	" "	"	8 "	100.1	8
Average of the treated plots			109.8	3	Average of the treated plots			136.8	11

The treatment with 1 to 2,000 gave the same results as the 1 to 1,000 solution. For purposes of comparison, the results obtained from Sections 2 and 3, and also Sections 4 and 5, are given in a condensed form in the following table:

SUMMARY OF RESULTS WITH DUPLICATE PLOTS.

Sections 2 and 3.					Sections 4 and 5.				
No. plots.	Treatment.	Length of Treatment.	Yield.	Per cent scabby.	No. plots.	Treatment.	Length of Treatment.	Yield.	Per cent scabby.
4	untreated	----------	133.6	67.7	4	untreated	----------	105	52.5
2	1-1,000	¼ hour	146.2	19.5	2	1-2,000	½ hour	124.7	7.5
2	"	½ "	132	18.5	2	"	1 "	121.5	20
2	"	¾ "	130.8	19.5	2	"	1½ "	120	4.5
2	"	1 "	117.1	15	2	"	2 "	111.3	10
2	"	1¼ "	137.9	11.5	2	"	2½ "	124.5	8.5
2	"	1½ "	129	4.5	2	"	3 "	110.8	4.5
2	"	1¾ "	143.1	9.5	2	"	3½ "	107.5	7.5
2	"	2 "	122.5	10	2	"	4 "	136.7	2.5
2	"	2¼ "	115.1	5	2	"	5 "	117.8	4.7
2	"	2½ "	114.7	5	2	"	6 "	131 3	4.
2	"	3 "	105.1	4	2	"	8 "	150	4.5
2	"	4 "	108.3	4.5					
Average of the treated plots			125.1	10.5	Average of the treated plots			123.3	7.1

There appeared to be as good results from the weaker solution as from the stronger. The per cent of scab on Sections 4 and 5 was less than on Sections 2 and 3 for the same length of immersion, but as the untreated plots had 15 per cent less scab it shows that it was probably outside influence that caused it. If the strengths used in these experiments for the time being be disregarded, the results of Sections 2, 3, 4 and 5 may be combined as follows:

FIG. 3. THE CROP FROM TREATED SEED.

FIG. 4. THE CROP FROM UNTREATED SEED.

GENERAL SUMMARY.

AVERAGE OF SECTIONS 2, 3, 4 AND 5.

No. of Plots.	Length of Treatment.	Yield.	Per cent scabby.	Per cent scabby. 10 20 30 40 50 60
8	untreated	119.3	60.1	
6	¼ and ½ hour	134.3	15.2	
6	¾ " 1 "	123.1	18.2	
6	1¼ " 1½ "	129	6.8	
6	1¾ " 2 "	125.6	9.6	
6	2¼ " 2½ "	116.1	6.1	
4	3 "	108	4.3	
6	3½ and 4 "	117.5	4.8	

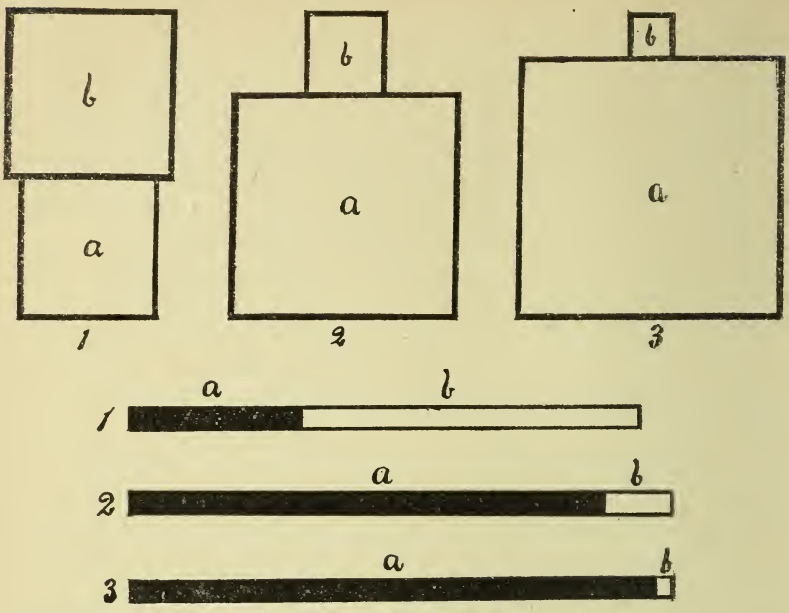
The final summary eliminates many of the accidental variations and as far as conclusions may be drawn from one year's work, it seems to show that the per cent of scab decreases as the length of time of immersion increases, but not in direct ratio. Those that were immersed an hour or less, have a comparatively large per cent of scab; when immersed over an hour, the amount of scab drops abruptly, as is shown in the above table for the one and one-quarter and one and one-half hour treatment. The per cent of scab here (6.8), being less than in the next series (9.6), shows that there is still a variation not yet eliminated. The longer immersions show that the scab decreases very slowly, and that for practical purposes one and one-half hour is sufficient.

Observe next the yields. There is an *increase* in yield of the treated plots over the untreated, but as the length of the treatment increases beyond one and one-half hours the *yield decreases.* Checking the scab seems to cause an increased growth, but when the seed is immersed two hours or more, the plants are so slow in starting that this increase is overcome.

The beneficial effect of the treatment is greater than is shown in the previous tables. The amount of scab on the tubers grown on the untreated plots was much greater than on the treated. On the latter the scab spots were mere pimples (Fig. 3), and not over one in ten showed even these. While on the former (Fig. 4) they were often as large as a twenty-five cent piece, and were formed upon more than half the tubers.

The diagrams show graphically the average results.

FIG. 5.—PER CENT AND AREA OF SCAB, TREATED AND UNTREATED.



1.—Untreated, (a) per cent free, (b) per cent scabby.
2.—Treated, (a) per cent free, (b) per cent scabby.
3.—(a) Area of scab on the untreated plots, (b) area of scab on the treated plots.
1.—Yield of the untreated plots, (a) free, (b) scabby.
2.—Yield of the treated plots, (a) free, (b) scabby.
3.—(a) Area of the scab on the untreated plots, (b) area of the scab on the treated plots.

A duplicate of this experiment was tried on land that grew a crop of potatoes in 1892. The soil was very uneven, and where the seed treated for a long length of time was planted it was low and moist. The scab and the yield increased as this lower ground was approached. There was much more scab in this duplicate experiment, showing that the germs from the previous crop remained in the soil and prevented the treatment from being a complete success, although the amount of scab was reduced one half.

GENERAL SUMMARY OF THE CHECK PLOTS.

No. of plots.	Length of treatment.	Yield.	Per cent scabby.	Per cent scabby. 10 20 30 40 50
8	untreated	65.4	55.5	
6	¼ and ½ hour	85	18.1	
6	¾ " 1 "	73	22.9	
6	1¼ " 1½ hours	98.2	20.5	
6	1¾ " 2 "	90.6	24	
6	2¼ " 2½ "	107.6	30	
4	3 "	107.1	43.2	
6	3½ " 4 "	121.7	37.5	

EFFECT ON THE SOLUTION OF TREATING THE SEED.

A solution of corrosive sublimate was made and a sample taken for analysis. In the remainder, six lots of potatoes were soaked for two hours each, it being at the rate of one bushel of potatoes to one gallon of solution. A second sample was then taken. The two samples were analzyed by Prof. F. S. Kedzie, who found that the amount of corrosive sublimate was reduced from .92 parts to 1,000 of water to .36 parts to 1,000 of water, or from 1 part of corrosive sublimate to 1,087 parts of water before treating the seed to 1 part to 2,777 parts of water after treating.

Taking this as a basis, it would be advisable, after soaking about twelve bushels of potatoes in 15 gallons of solution, to add three-fourths of one ounce of the poison to the solution, so that the strength will not become too weak.

BORDEAUX MIXTURE FOR THE SCAB.

Rural New Yorker No. 2 potatoes were treated for the scab with Bordeaux mixture. The strength used was 4 pounds of sulphate of copper, 3 pounds of lime and 32 gallons of water.

Two plots were used, one containing 1,000 pounds of "Potato Grower" per acre and the other 2,000 pounds per acre.

RESULTS WITH BORDEAUX MIXTURE FOR SCAB.

Length of treatment.	Fertilizer, 1,000 lbs. per acre.		Fertilizer, 2,000 lbs. per acre.		Average of the two plots.	
	Yield per acre.	Per cent scabby.	Yield per acre.	Per cent scabby.	Yield per acre.	Per cent scabby.
Untreated	200.7	41	152.7	56.5		
"	152.5	41.5	174.6	62	170.1	50.2
5 minutes	142.5	9	122.2	13	132.3	11
¼ hour	187.5	5	173.6	11	180.5	8
½ "	209.5	24.5	164.4	13	186.9	18.7
¾ "	176.4	15	174.2	7	175.3	11
1 "	181.4	11	105.7	15	143.5	13
1¼ "	165	8	183.3	4.5	174.1	6.2
1½ "	146.6	13	148	5	147.3	9
1¾ "	161.6	9	166.4	17	164	13.5
2 "	218.9	5	196.4	6	207.6	5.5
2½ "	184	10	200	10	192	10
3 "	180	19	201.6	7	190.8	13
3½ "	230	13	234.2	12	232.1	12.5
4 "	174	7	204.9	12	189.4	9.5
Average untreated	170.1	50.2				
" treated	178.1	10.8				

The Bordeaux mixture makes nearly as good a showing as the corrosive sublimate as far as the per cent of scabby tubers is concerned, but in the size of the scab spots there was no difference between those on the treated plots and those on the untreated, all being very small. Trials under more adverse conditions are necessary to establish its real value for this disease.

The above results seem to show that a treatment for a short length of time is as effective as the longer treatments. On the other hand there seems to be no injury to the tubers when soaked for long lengths of time.

CONCLUSIONS FROM THE SCAB EXPERIMENTS.

1. The potato scab can be readily and cheaply controlled.
2. Corrosive sublimate is the best remedy known as yet. Bordeaux mixture is promising.
3. Ground once infected with scab will retain the germs for several years and treating the seed for such ground will not be as effective.
4. The treatment causes not only a more salable product, but within proper limits an increased yield.
5. Corrosive sublimate, 1 part to 2,000, seems to be as effective as 1 part to 1,000. The latter strength is preferable as the solution gradually loses strength.
6. The best length of time to soak the seed is about one and one-half hours. A longer soaking may lessen the scab still more, but it reduces the yield.

PRACTICAL SUGGESTIONS FOR TREATING FOR SCAB.

Use two ounces of corrosive sublimate to sixteen gallons of water. Dissolve the poison by first wetting it with an equal amount of water, stirring it until it is all made fine and is thoroughly wetted. If it is to be used at once, it should be turned into about two gallons of hot water to dissolve it quickly. *Never use metal dishes. Always take earthen or glassware, or wooden pails.*

For treating small quantities, barrels, half barrels or tubs may suffice. The tubers may be enclosed in a coarse sack and thus immersed, or they may be poured into the barrel, and, when ready to be removed, a burlap cloth can be stretched over the top of the barrel and the liquid strained into another vessel, and the potatoes dumped on the ground.

For treating larger quantities, a less laborious method would be to use a long and rather narrow box, or a watering trough can be used. The tubers can be taken out with a wire or perforated wooden scoop. The tubers should soak about one and one-half hours. After soaking three pecks of potatoes to each gallon of solution, if there are many more to treat, about three-eighths of the original amount of corrosive sublimate should be added, together with sufficient water to replace what has been wasted in removing the potatoes.

All wooden vessels that have contained the solution can be made suitable for general farm use again by washing thoroughly in clean water and then in water containing a little sal-soda.

Soak the potatoes when ready to cut the seed. Of the two operations the soaking should preferably be done first, although it is not necessary.

The expense of this treatment is very slight, consisting merely of the cost of the poison and the time of putting the potatoes in and taking them out of the solution. The operator may be employed the balance of the time in cutting seed.

Corrosive sublimate is worth about $1.00 per pound, and two ounces should not cost more than fifteen to twenty cents. For the accommodation of those who cannot obtain it readily, arrangements have been made with C. Alsdorf & Son, Lansing, who will send four ounces, post-paid, for twenty-five cents. It will be in one ounce packages, ready for use. The cash outlay for the treatment is about two cents per bushel at the outside.

This remedy was tried by hundreds of farmers the past season, and in no case, when it was properly used, has an unfavorable report been received.

All seem well pleased with it, and one correspondent reports an increase in his crop of one hundred bushels of marketable potatoes per acre as a result of the treatment.

When such marked benefits can be obtained from so small an outlay, no potato grower can afford not to use this remedy.

FERTILIZER TESTS.

In the tests of fertilizers upon potatoes, the same plots and the same fertilizers were used as heretofore. A continuation of these tests will show how well chemical fertilizers will keep up the fertility.

Each plot is one rod wide and four rods long, and contained three rows of potatoes. The rows are three feet apart and the remaining space is occupied by young pear trees. Four plots are in a row, and the fifth plot begins back by the side of the first plot. The fertilizers were applied both above and below the seed.

The planting was done on May 19 and 20. On the appearance of the vines considerable trouble was experienced from potato beetles, and the August drought reduced the yield to a noticeable degree.

The plots IIa, VIa and Xa were one square rod of the nothing plots of the previous years, fertilized this year by 1,000 pounds per acre of "Potato Grower" fertilizer, made by the Michigan Carbon Works, of Detroit.

FERTILIZER TESTS.

Plots.	Fertilizer.	How applied.	Yield per acre.—Bushels.						
			O. K. Mammoth.	Rochester Favorite.	Rural New Yorker No. 2.	Average yields.			
						1893.	1892.	1891.	For 3 years.
I	Mulch between rows		133	85.8	127.5	115.4	156.6	262.2	178
IIa	Potato grower	Under seed	179	229.1	196.6	201.6			
IIb	Nothing		53.8	45.8	74.3	58	102.6	166.9	109
III	4 lbs. sulphate ammonia	Under seed	78.2	141.1	179.5	132.9	130	221.2	168
IV	10 lbs. ground bone 6 lbs. muriate potash	Over seed	36.8	53.7	77	55.8	132.6	196.3	128
V	Manure	Under seed	150.6	153.6	163.6	155.9	173.2	219	183
VIa	Potato grower	Over seed	112.3	196.5	173	160.6			
VIb	Nothing		54.6	47.9	72.3	58.3	73.1	170.6	101
VII	4 lbs. sulphate ammonia	Under seed	74.9	128.8	136.7	113.5	156.5	216.2	162
VIII	10 lbs. ground bone 6 lbs. sulphate potash	Over seed	68.8	57.2	197.2	107.7	93.8	171.9	125
IX	1 bu. wood ashes		79	84.7	169.3	111	80.5	163	118
Xa	Potato grower	Under seed	255.1	220.6	227	234.2			
Xb	Nothing		77.2	124.3	113.5	105	54.8	172.2	111
XI	6 lbs. nitrate soda	Under seed	103.4	161.1	217.2	159.9	96	184.9	147
XII	10 lbs. ground bone 6 lbs. sulphate potash	Over seed	107.8	132	139.4	126.4	96.5	143.1	122
XIII	Manure	Over seed	111.3	126	158.9	132.1	105.9	188.8	142
XIV	Nothing		83.8	125.8	115.9	108.5	51.3	128.9	96
XV	10 lbs. ground bone	Under seed	134.2	134.1	137.9	135.4	150	231	172
XVI	6 lbs. sulphate potash	Over seed	162.7	197.7	185.9	182.1	156	199.3	179
XVII	Nothing		70.3	92.4	95.6	86	45.5	115.4	82
XVIII	6 lbs. sulphate potash	Under seed	58.8	160.5	108.9	109.4	64.7	194.4	123
XIX	6 " " "	Over seed	84.7	179.6	179.9	148.1	47.9	190.4	129
XX	6 lbs. nitrate soda 10 lbs. ground bone 6 lbs. muriate potash	Under seed	120.4	237.9	221.1	193.1	114.1	186	164

In examining the yields, attention is called to the fact that each row contains a nothing plot. The yields of these nothing plots vary somewhat, but as the soil in each tree row is quite uniform the nothing plot of that row should be used as a base of comparison for the plots of that row.

The following table shows the gains of the fertilized plots over the nothing plots, and it should be used in determining the relative value of the fertilizer in the different rows.

GAIN PER ACRE FROM THE USE OF FERTILIZERS.

Plot.	Gain in bushels.				Gain illustrated.	Fertilizer.
	1893.	1892.	1891.	Av. 3 years.	20 40 60 80	
I	57.4	54	95.7	69		Manure.
V	97.6	100.1	48.4	82		
XIII	23.6	54.6	59.9	46		
III	74.9	27.4	54.3	52.2		Complete fertilizer.
IV	2.2	30	29.4	19.1		
VII	55.2	83.4	45.6	61.4		
VIII	49.4	20.7	1.3	23.8		
XI	54.9	41.2	12.7	36.3		
XII	21.4	41.7	29.1	11.3		
XX	107	68.5	70.6	82		
XV	26	98.7	102.1	75.6		Ground bone and potash.
XVI	73.6	104.7	70.4	82.9		
IX	6	25.7	9	7.6		Ashes.
XVIII	23.3	19.2	84	42.2		Potash.
XIX	62	2.4	75	46.5		

It should be noted that in plots IV, VIII, XII and XIII, where the gain was comparatively small, the fertilizers were applied over the seed and the difference was without doubt due to the lack of moisture to dissolve them.

The results of this, the third year of the experiment, are very much like those of last year. The most noticeable change is that the plots with commercial fertilizers are decreasing in yield rapidly while the manure plots show but a small decrease.

The use of commercial fertilizers for potatoes is advisable when the soil lacks fertility, and well composted manure is not available. Good preparation of the soil is necessary to secure an increase of crop sufficient to pay the additional cost of the fertilizer.

LEAF-BLIGHT OF THE POTATO.

A bacterial disease, has been quite injurious at the college for several years. It appears during the hot, dry weather and is especially severe on those varieties that are at that time half grown. In 1892 the mid-season varieties and the early kinds escaped. This season, it was the opposite, but in both cases it was the most injurious upon those varieties that had reached a certain stage of growth, when the heat and drought became severe.

Vines killed by the leaf-blight are readily distinguished from those killed by the drought. In the former case the leaf turns black at or near the tip. This blackened area increases until in about a week one-half to three-fourths of the leaf surface is affected. At this stage if the weather continues unfavorable the drought aids in killing the weakened vines. Vines killed by heat and dry weather lack the discolored leaflets, and the leaf stems and small branches hang pendant on the upright stalks. The only remedy is to fight the drought.

AGRICULTURAL COLLEGE, }
February 1, 1894. }

VARIETY TESTS OF VEGETABLES.

BY L. R. TAFT.

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Cabbage (R. J. Coryell)	50	Cucumbers (H. P. Gladden)	61
Cauliflower " "	51	Lettuce " "	62
Sweet corn " "	51	Salsify " "	62
Peas " "	55	Squashes " "	62
Beans (H. P. Gladden)	60	Tomatoes " "	63
Celery " "	61		

For several years it has been the custom of this department to make careful tests of the varieties of vegetables sent out by the different dealers as novelties, and to issue the results in bulletin form at the end of the season. Many of these so-called new sorts are sold at prices much above those of standard varieties, but although highly praised by the introducers, are not always worthy. On the other hand, they are often greatly improved strains of some of the old and valuable sorts or new and distinct varieties of marked merit, and would then be desirable acquisitions.

The purchaser can only determine their value by actual trial, and for any one person to purchase and grow all the highly praised varieties sent out in a single season will require a large expense in money and time. The Experiment Station can do this work and the reports of the results of the trials will be of value to every one who purchases garden seeds. It must be admitted, however, that in many cases we are one year behind the time, but the grower will have the report for use the next year and by that time the cost will be reduced so that a start can be obtained with a smaller outlay. It is desirable, and the seedsmen are each year doing it more and

more, that promising novelties be submitted for trial, to some half dozen experiment stations in different parts of the country, who make a specialty of testing varieties, the year before they are catalogued. Before a seedsman takes up a novelty he generally tests it for at least one season upon his own trial grounds, and if, when he obtains a sample of a variety which he proposes to introduce should it upon trial prove desirable, he would send a sufficient amount to some of the experiment stations, or require the originator to do so, not only might it save the public from loss should it be inferior, but, if it has real merit, a report to that effect by the stations would both increase the sales of the dealer and assure the public that the variety has value.

In the course of our variety tests we have had frequent occasion to ascertain the character of the seeds sold by different dealers, both as to vitality and the value of the strains, and we believe that most of them are doing what they can to keep their seeds up to a high standard. We find that as a rule far better results are obtained when the seeds are ordered direct from the dealers, rather than purchased as box or bulk seeds of a grocer; but, however reliable a seedsman may be, it will always be found safest to test the vitality of the seeds before putting in the crop. Seeds of low germinating power are occasionally sent out by all dealers, unwittingly often times, and a few minutes spent in testing the seeds may save one from serious pecuniary, as well as a vexatious loss.

The tests of the cabbages, cauliflower, sweet corn and peas have been under the charge of my assistant, Mr. R. J. Coryell, and the report was prepared by him, while Mr. H. P. Gladden has looked after the beans, celery, cucumbers, lettuce, salsify, squashes and tomatoes, and has prepared the appended notes. Quite a variety of other vegetables were grown, but in very few of them were there any novelties that have been found better than the old sorts.

The seeds used in the tests were obtained from the following firms: Robert Buist, Jr., Philadelphia, Pa.; Atlee Burpee & Co., Philadelphia, Pa.; Currie Bros., Milwaukee, Wis.; D. M. Ferry & Co., Detroit, Mich.; J. J. H. Gregory, Marblehead, Mass.; Peter Henderson & Co., New York; D. Landreth & Sons, Philadelphia, Pa.; A. W. Livingston's Sons, Columbus, Ohio; W. H. Maule & Co., Philadelphia, Pa.; A. M. Nichol, Granville, Ohio; W. W. Rawson, Boston, Mass.; John A. Salzer, La Crosse, Wis.; J. M. Thorburn & Co., New York City, and J. C. Vaughan, Chicago, Ill.

CABBAGE.

R. J. CORYELL.

The forty-eight varieties tested this year included nearly all of the new sorts listed by the seedsmen, and some of the standard kinds for comparison. The seeds were sown in the forcing house on March 20. The plants were transplanted into flats on April 8 and set in the field May 16.

The severity of the drought, which extended from July 16 to well into September, was so great that the test was a failure in that many kinds headed out of season. The test was of value since it showed clearly those kinds that would produce a good crop under adverse conditions. The earliest varieties were not affected, the injury being most severe on those that mature at midseason or later. Of these the larger kinds, or those

that have many leaves, suffered most. The medium-sized varieties that had but few outside leaves were generally uniform in heading and produced a fair crop.

Of the early varieties the *Etampes*, Currie, and *Lightning*, Salzer, were the first to head. The latter, a strain of the Wakefield, produced very even, solid heads. The *Charleston Wakefield*, Henderson, was a day or so later and enough larger to make up the difference in time. *Eclipse*, Currie, advertised as a second early variety, matured with the *Charleston Wakefield*. The type did not appear to be fixed, but a good crop was produced. Following these kinds within a week are several larger varieties. *Henderson's Early Summer*, Ferry, proved to be an excellent strain of that well-known sort. *Ideal*, Salzer, was much like it and as good. *Bloomsdale Early Market*, Landreth, and *Early Flat Dutch*, Ferry, were of the same season as the preceding kinds, but not so good.

Of the mid-season sorts, *All Seasons*, Ferry, followed closely the second early kinds. Every plant produced a salable head. It is a strain of the *Flat Dutch* and will be found a reliable variety.

Succession, Ferry, was four days later than *All Seasons* and much like it, maturing in eighty-six days from the time of setting in the field. It was the best variety of this class and in fact the best of any planted this year. The heads were of medium size, solid and uniform. The stump was short and leaves few. *Reynolds*, Maule, and *Fottler's Early Drumhead*, Ferry, were a few days later than *Succession*. They produced uniformly good heads.

All the late cabbages did poorly. *Autumn King*, Henderson, and *World Beater*, Burpee, are similar in growth and appearance. *Safe Crop*, Burpee, did fairly well. *Large Late Mountain*, Landreth, resembles the preceding variety closely. Fewer plants headed, but those that did were much better.

CAULIFLOWER.

Eleven varieties were tried. They were treated nearly the same as the cabbages, being planted and cultivated on the same dates, but were given richer soil. The drought affected them as it did the cabbages, causing a failure of the later maturing varieties.

Of the earlier varieties, the *Snowball*, Ferry, *Dwarf Erfurt*, Ferry, and *Sea Foam*, Rawson, were the best in the order named.

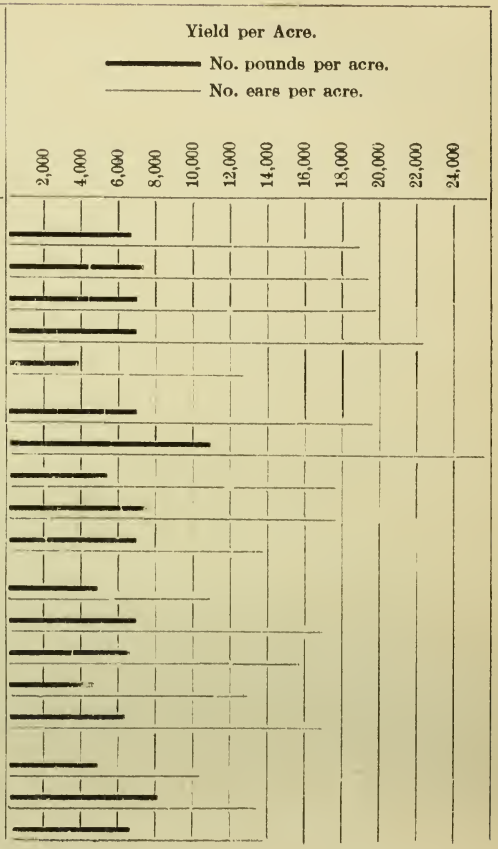
Mont Blanc, Buist, made a good showing. The head is well protected by leaves, which is an advantage to it. *Autumn Giant*, Vaughan, was much like this variety but it did not do as well.

SWEET CORN.

Each variety of sweet corn occupied a row 100 feet long, except in a few cases where the amount of seed was too limited. The rows were four feet apart and the hills in the row were put at a greater or less distance according to its growth. The planting was done on May 25. Five kernels were placed in a hill and afterwards thinned to four stalks. Many kernels did not germinate and the varieties did not average more than three stalks per hill. All varieties grew well until the hot winds and drought came during the first part of August, which affected all except the earliest varieties. The frost injured a few of the later kinds.

TABLE NO. 1.—VARIETY TEST OF SWEET CORN.

Variety.	Seedsman.	Distance between hills as planted.	Distance between hills recommended.	No. days to market maturity.	Height of stalks in feet.	No. of stalks.	Av. No. of ears per stalk.	Av. weight of ears in ounces.	Av. length of ears in inches.	No. rows of kernels.
Cory	Ferry	2½	2½	67	3	105	1.11	5.3	5	8
White Cob Cory	"	2½	2½	67	3	102	1.12	6.2	5	8
Eastman Early	Hicks	2½	2½	70	3	33	1.15	5.6	5	8
First of All	Maule	2½	2½	70	3½	96	1.27	5.6	5	8
Early Maine	Vaughan	2½	2½	71	3½	121	.75	5	6	8
La Crosse	Salzer	2½	2½	71	3¼	119	1.14	5.6	7	8
Ex. Ey. Vermont	Hicks	2½	2½	72	2¾	68	1.42	7.1	6	8
Northern Pedigree	Ferry	3	2½	73	3	49	1.24	5.2	5	8
Chicago Market	Buist	3	3	74	5	68	1.22	7.1	6	12
Perry Hybrid	Ferry	3	3	74	5	73	.97	8.3	7	12
Leets Early	"	3	3	76	4	77	.81	7	7	12
Crosby	"	2½	3	76	4	85	.96	6.3	5	10
Early Champion	Vaughan	2½	3	76	4	114	.91	6.7	5	12
Early Minnesota	Ferry	3	3	78	5	93	.86	6.1	6	12
New Eclipse	Hicks	2½	2½	78	2½	21	1.19	4.8	5	8
Concord	Ferry	3½	3½	79	5½	98	.58	7.6	5	14
Perkins Early Market	Buist	2½	3½	81	5½	127	.79	9.8	8	8
Golden Nugget	Gregory	4	3½	82	4	44	1.25	7.6	6	10



Pee and Kay	Ferry	3	3	88	4½	82	.76	9.8	6	12
Mexican	"	3½	3½	88	4	21	.90	7.5	7	8
Stabler Early	Buist	3	3	85	3½	37	1.19	13	8	12
Hickox Hydrid	Ferry	3½	3½	85	5½	73	1.26	7.3	6	8
Nonesuch	Maule	3	4	86	6	68	.97	9.8	6	10
Egyptian	Ferry	4	4	88	6½	70	1.44	9	7	14
Ne Plus Ultra	Buist	3½	3½	90	4½	44	1.73	8.1	6	12
Stowell Evergreen	Ferry	4	4	90	5¾	55	1.02	12.	7	16
Squantum	Henderson	4	3½	91	5⅔	77	.78	7.3	6	10
Stabler Pedigree	Buist	3	3½	95	6	51	.96	9.3	7	10
Old Colony	Ferry	3	3½	95	5	84	.52	8.2	5	16
Gold Coin	Vaughan	4	3½	96	5	41	1.27	9.6	6	14
Triumph	Buist	4	3½	96	4	38	1.16	10	7	8
Zigzag	Northrup, B. & G. Co.	2½	4	98	6¼	105	.69	8	5	12
Country Gentleman	Henderson	4	4	102	6¼	52	1.35	8.1	6	14

When the ears had reached the edible stage, all except those upon four or five hills were gathered, counted and weighed. Those that remained were allowed to mature and were then counted and their weight estimated to be the same as the others. This formed the data for determining the yield as shown in the table. In computing the yield per acre, four stalks were reckoned per hill, which was not the actual case, but it gave a fairer estimate of the value of that variety than had the actual number of stalks been used.

The distance apart that each variety should be planted was carefully studied and the one recommended as well as the distance actually used this year is given in the table. This point may be of value to some in making the most economical use of their land when sweet corn is grown in large quantities. Many varieties would do better by being planted less than four feet apart in rows and at a greater distance between the hills than is recommended in the table.

The following are new varieties:

Eastman Early.—D. C. Hicks, North Clarendon, Vt. A variety similar in growth and in ear to the *Cory* The ears are not quite so regular nor as even in size as that variety and the kernels are more wrinkled than any of the early varieties, while the cob is variable in color from white to pink.

Extra Early Vermont.—Hicks. This is the most prolific variety among the early kinds. While excelled by the *Cory* and *White Cob Cory* in earliness, its productiveness makes it valuable. It set at least two ears per stalk and matured this year with us an average of one and one-half ears. The type is not yet fixed, the cobs varying from white to red; ears slim, of fair length and well filled.

Early Champion.—Vaughan. This variety follows the first early kinds within ten days. The ears were of good diameter, but were very short this year, while the plants lacked productiveness.

New Eclipse.—Hicks. An eight-rowed variety having the same characteristics as the *Cory*, but maturing later. While setting a sufficient number of ears, they were very small and poorly filled.

Zigzag.—Northrup, Braslan & Goodwin Co. This is a late variety covering a long season. There is little or no difference between it and *Country Gentleman.*

The following varieties are recommended:

EARLY.

White Cob Cory, Extra Early Vermont, Chicago Market and *Stabler Early.*

MIDSEASON.

Egyptian and *Nonesuch.*

LATE.

Gold Coin and *Country Gentleman.*

PEAS.

Fifty-six varieties were tested. These included most of the new varieties and many standard sorts. Considerable attention was paid to classifying the varieties. Those that were known to be of the same season and the same manner of growth were planted close together for convenience in comparison.

On May 10 the seeds were sown, two hundred seeds of each variety being planted in double rows ten feet long. After the vines were well up, all but one hundred were removed and the remaining vines were supported by a woven wire trellis. The season was favorable for a good test, although the hot weather hastened the maturity of the late varieties.

When the pods were in an edible condition, they were picked and the data for the last three columns of the table were obtained from them.

Among the smooth white, early varieties there is but little choice. The *Bergen Fleetwing* was the most prolific, but the pods were small. *Maud S* and *Extra Early* had the best filled pods. In earliness, there appeared to be no choice.

Following these varieties very closely are several blue peas. Although edible in from forty-nine to fifty-one days, they were about four days behind the first early kinds in market maturity and in ripening.

Between the *Alaska*, *Clipper* and *Lightning* there appeared to be no difference. Of these the table shows the *Clipper* to be the best, although, as they grew, no choice was noted. Of these second early peas the *Blue Beauty* easily stands at the head. It is a dwarf, stocky grower, productive of medium sized well-filled pods. *Universal*, a new variety of dwarf habit, is fairly promising. The pods are small and rather variable. *Chelsea* differs from the *Premium Gem* in the color of the peas and slightly in the appearance of the leaves. *McLean's Little Gem* belongs in this season. The pods are of good size and the peas are of good quality. It is well known and planted everywhere. *Kentish Invicta* is a very prolific variety, but its pods ran very small at the last. *Wm. Hurst* withstood the hot weather well. The pods were crisp and the peas were very sweet, but the vine was unproductive.

Exonian, a new kind imported into this country, is a day or so later than the above varieties. It is fairly promising, but did not withstand the heat as did the native sorts. *Early May*, a new variety, was said to be as early as the *American Wonder*, but it was much later. The pods are mostly borne profusely in pairs, and all reach maturity nearly at the same time. It fills the season very nicely between the second early and the mid-season kinds. *Petit Pois* is a new variety introduced from France as of the highest quality. The vines are slim, medium tall, and very productive of rather small but closely filled pods. The peas are very delicious until full grown, when they rapidly harden. *Profusion* is a good variety for this season; its pods ran rather small at the last picking.

Following these varieties come those that are known as the mid-season kinds, most of which have larger pods than those preceding. Among these varieties there are a large number that are so nearly alike in growth, pod and season, that if a grower had one of them he would not need any of the others.

Belonging in one class are the *Stratagem, Juno, Stanley, Shropshire Hero, Pride of the Market, Gladiator* and *Heroine.* These have strong, stocky vines about two and one-half feet high, and bear medium large, thick, well-filled pods that are slightly recurved. The pods are borne near the extremity of the vines and reach maturity nearly at the same time. Also covering the same season are the *Abundance, Bliss Everbearing, Blue Imperial* and *Yorkshire Hero.* These varieties have smaller, broader, flatter and more pointed pods than the *Stratagem* class. These differ from each other in season slightly. The *Yorkshire Hero* is a little later and the *Blue Imperial* is slightly earlier than the *Bliss Everbearing.*

The *Telegraph, Long Island Mammoth* and *Evolution* are varieties of medium tall, slim growth that cover a longer season than the preceding mid-season varieties. Their season begins with the *Stratagem* class and extends several days later. This is especially true of the *Long Island Mammoth,* from which edible peas could be picked for a period of eighteen days. *Fill Basket* resembles these varieties in the shape of its pods, but the vines are shorter and more stocky. It covers a long season and was the most productive variety of the mid-season sorts.

The *Duke of Albany* and *American Champion* are alike in every respect. Vines are talls and pods large. The pods of the former were not always well filled. They cover the same season as the *Evolution* class.

Eugenie, a new dwarf variety that follows the *Stratagem* class in a few days, is very productive. Pods medium large, well filled. *Dwarf Telephone* is a short, stocky variety with large, long pods like those of the *Telephone,* but it is more productive. In season it is about two days later than that variety. *Sutton Satisfaction* is a new late variety, very branching and very prolific if planted thinly.

Melting Sugar and *Tall Sugar* are two varieties with edible pods. The former is in season just before the *Stratagem,* while the latter follows the *Champion of England.* They are very tender and all parts cook nicely except the ventral suture, which remains stringy.

Best varieties for planting:

EARLY.

Extra Early or *Maud S.*

SECOND EARLY.

Blue Beauty. Early May.

MID-SEASON.

Fill Basket, Heroine, Eugenie.

LATE.

Sutton Satisfaction, Champion of England.

The following new varieties are promising:

Dwarf No. 2, Universal, Exonian, Early May, American Champion, Dwarf Telephone, Eugenie, Sutton Satisfaction.

TABLE No. 2.—VARIETY TESTS OF PEAS.

VARIETIES. Arranged in order of their maturity.	Seedsmen.	Per cent of germination.	Height of vines.	No. days to edible maturity.	No. pods per 100 vines.	Average No. peas per pod.	Per cent. of peas to total weight.	Yield in ounces from 100 vines.
Bergen Fleetwing	Gregory	78	2	48	526	4.1	59	72.7
Burpee Best	Burpee	59	2	48	465	5	57	64.6
Challenge	Currie	78	1¾	48	398	6	48	61.3
Extra Early	Ferry	74	1⅔	48	443	7	46	62.9
Hancock	Gregory	79	1¾	48	440	5.6	51	62.5
Morning Star	Buist	74	1¾	48	396	5	53	59.4
Maud S.	"	61	1⅔	48	396	7	49	64.9
Bergen X American Wonder	College	62	2	48	492	5.2	50	72
Dwarf No. 2	Hicks	100	1¼	48	326	5.7	55	69.1
Dwarf No. 4	"	92	1½	48	350	4.25	60	49.7
Alaska	Ferry	79	2¾	49	380	6.25	58	64.4
Clipper	Rawson	80	2½	49	484	6	47	78.4
Lightning	Dreer	45	2½	49	485	5	66	66.9
Alpha	Ferry	50	2½	49	380	6.25	64.4	53
American Wonder	"	49	1	50	341	6	63.3	62
Blue Beauty	Buist	28	1½	50	803	5.3	47	134.9
Chelsea	Henderson	59	1½	50	405	5.6	56	79.4

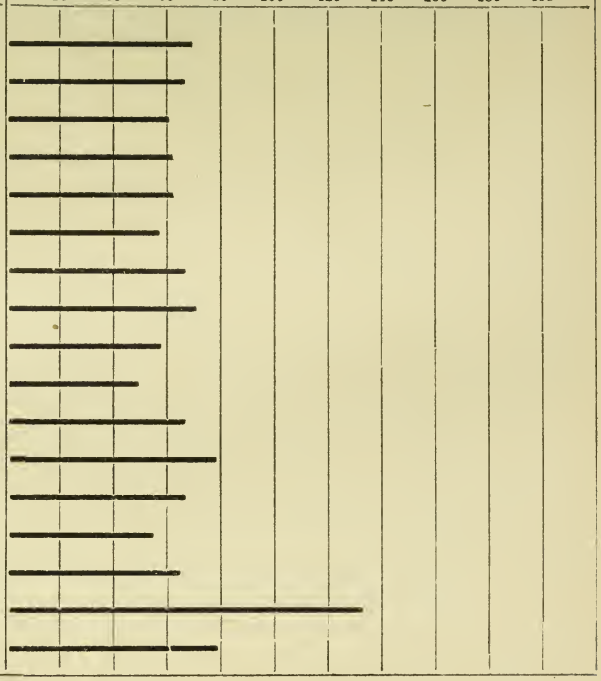
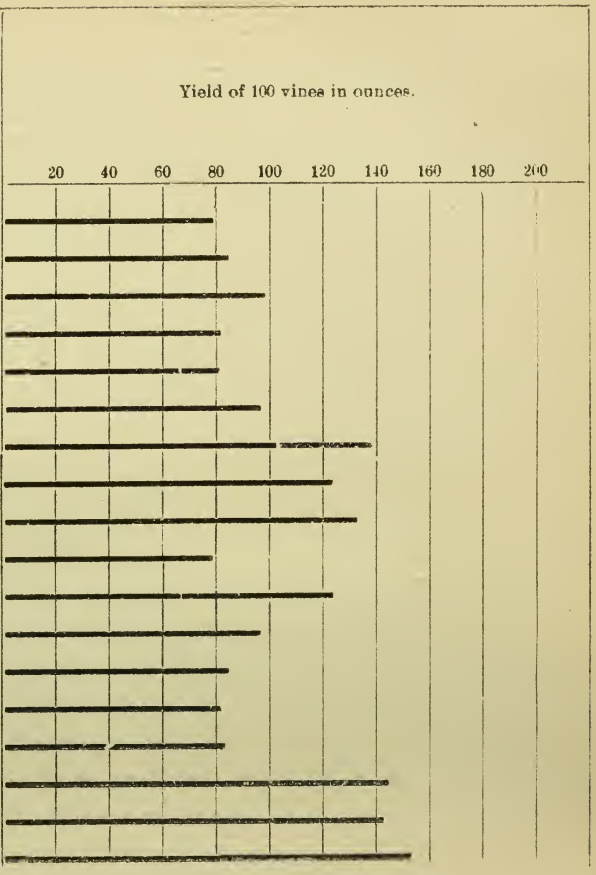


TABLE NO. 2.—VARIETY TESTS OF PEAS.—*Continued.*

VARIETIES. Arranged in order of their maturity.	Seedsmen.	Per cent of germination.	Height of vines.	No. days to edible maturity.	No. pods per 100 vines.	Average No. peas per pod.	Per cent of peas to total weight.	Yield in ounces from 100 vines.
Premium Gem	Ferry	50	1½	51	370	6	52	79.2
McLean Little Gem	"	46	2	51	425	5.8	47	83.4
Universal	Childs	66	1¾	50	585	5	48	99.6
Kentish Invicta	Ferry	75	3	51	710	5.25	48	82.4
Wm. Hurst	Burpee	50	1½	52	420	5.5	63.5	81.5
Exonian	Thorburn	48	2½	53	509	5.3	52	97.5
Early May	Salzer	59	1½	55	785	7.7	52	139.7
Petit Pois	Henderson	67	3	56	890	6	51	121
Profusion	Burpee	30	2	56	678	5	48	134.3
Stratagem	Ferry	75	2½	61	445	4.6	52	76.7
Juno	Henderson	45	2½	60	567	5.7	55	123
Stanley	Dreer	53	2¼	60	470	5.1	50	98.5
Shropshire Hero	Maule	62	2½	60	445	5.5	55	85.9
Pride of the Market	Ferry	47	2	60	341	5.5	54	82.1
Gladiator	Henderson	48	2¼	61	378	5.3	49	82.5
Heroine	Dreer	30	2½	60	500	6.2	58	144.9
Heroine	Henderson	52	2½	61	425	6.3	45	142.8
Abundance	"	23	3	61	844	5.2	49	148.8



Bliss Everbearing	Ferry	47	2½	61	571	5.2	47	109.7
Blue Imperial	"	78	2	59	330	4.75	45	97.3
Yorkshire Hero	"	25	2¼	63	441	4.3	52	106.7
Melting Sugar	"	91	5	58	510	5.4	45	104.2
Telephone	"	25	4½	60	270	5.7	52	65.5
Forty Fold	Buist	45	4	61	505	4.6	49	101.1
Admiral	Ferry	80	3	61	745	7	52	137
Telegraph	"	62	3½	59	470	6.6	46	125
Telegraph	Dreer	54	3½	60	480	6.4	44	138
L. I. Mammoth	Childs	57	3½	59	731	5	55	137.4
Evolution	Henderson	52	3½	61	530	6.1	48	132.5
Fillbasket	"	25	2½	62	646	7	52	187
Eugenie	Buist	28	2	63	741	6.8	52	173.4
Market Garden	Henderson	60	2½	63	590	5.9	65	133.8
Dwarf Telephone	Hicks	87	1¼	62	309	7	47	145.7
Champion of England	Ferry	31	5	63	785	7.2	52	190.2
American Champion	Henderson	36	3½	62	409	5.5	48	128.4
Duke of Albany	Ferry	40	3½	63	399	5.1	51	98.4
Sanders Marrow	Henderson	28	5	65	768	8.2	34	135
Sutton Satisfaction	Currie	6	2½	65	827	5	44	202
Tall Sugar	Ferry	66	5	73	520	5 7	45	98

BUSH BEANS.

H. P. GLADDEN.

Beans do best in a rather light, well drained soil. Although, in ordinary soil, a fair crop may be grown without the use of manure, its application, in a well-rotted form, can be made with profit.

If the garden is laid out in long rows, which is the preferable way, as it permits the use of the horse cultivator, the drills should be from two and one-half to three feet apart, but where the work is done by hand, the rows may be as near as fifteen or eighteen inches. The beans should be sown two or three inches apart in the drills, and, after covering two or three inches deep, the soil should be firmly pressed over the seed.

Beans are easily injured by cold or excessive moisture. It is usually safe to plant the first crop at the time corn is planted. For a succession sow every two or three weeks until the first of August.

Care should be taken to give the plants shallow cultivation, as disturbance of the roots, especially during the blossoming period, will result in a decreased crop.

There are many varieties of beans differing in earliness, productiveness and in the size, color and quality of pod and seed. Of the green-podded varieties, a well selected strain of *Red Valentine* will prove satisfactory. For a family garden preference is given to the wax-podded sorts. *Cylinder Black Wax* is very productive, with long, round and light yellow pods. This variety planted in succession will give snap beans that are tender and of best quality throughout the season. *Mammoth Wax* and *Butter Wax* may also be mentioned in this class. As a shell bean, *Dwarf Horticultural* or *Goddard Bush* are excellent. Among the recent introductions may be mentioned *Speckled Wax*, very promising as a snap bean and later as a shell bean.

POLE BEANS.

This class of beans is very tender and should be planted two or three weeks later than the bush beans. The rows should be from four to five feet apart, with four feet between the hills. The poles, which should be about eight feet long, can best be set in place before the beans are planted, as disturbing the young plants injures their growth. It is well to make the hill quite rich, by working into the soil a shovelfull of well composted manure.

Golden Cluster is an excellent pole snap bean. The plants are strong growing and very productive, and the pods are large, tender and of the best quality. *Golden Champion* is also a good variety.

The *Pole Limas* are late in maturing and are usually killed by frost before much of the crop has been gathered.

A variety worthy of special mention is the *Horticultural Lima.* It is productive and ripens the crop before frost comes. It is unexcelled as a green shell bean and is a good cooking bean when mature.

Warren, Gregory. A recent introduction. Plants of strong, vigorous growth; pods three to four inches long, usually straight; flesh thick, tender and of best quality. The plants are productive and the pods mature successively for a long season. An excellent home variety.

CELERY.

Celery is seldom grown in the farm garden, as its cultivation is thought too difficult for the amateur. The growing of this excellent vegetable is not so hard as imagined and it should receive more attention than is now given it. The seed should be sown early in the spring. Select a level spot and make it rich with well rotted manure. Thoroughly pulverize the soil and sow the seed in rows about eight inches apart. The seeds are small and an ounce will produce over five thousand plants. When the plants are three or four inches high the tops should be clipped to make the plants stocky. To grow good celery it is quite necessary that the soil be heavily manured and one that will not dry out, and, if possible, loose and deep, though good celery may be grown on clayey ground. The rows may be four or five feet apart and the plants six inches distant in the rows. The plants should be set not deeper than they were in the bed and the soil firmly pressed about the roots. When the plants are about ten inches tall the celery wanted for fall use should be banked up to blanch it; this operation should be repeated as the tops grow. The celery intended for winter storing should be earthed sufficiently to induce the stalks to grow upright. Celery will stand several degrees below freezing without serious injury. About the first of November the plants should be placed in trenches or in the cellar to blanch for winter use. If stored outside trenches should be dug eight or ten inches wide and as deep as the celery is tall. The earth should be loose at the bottom of the trench. The plants, with the roots on, are taken from the rows and packed closely in the trench with the tops even with the surface. As cold weather comes on the tops should be covered gradually, with some loose material, until they are protected from serious freezing. Celery may be placed in the cellar by having boards eight or ten inches apart to prevent packing in a compact mass. Soil should be packed about the roots that they may start to grow, as this growth in the trench or cellar blanches the stalks. Earth is not necessary between the stalks.

The dwarf varieties seem to give better satisfaction than the larger growing kinds. *Golden Self Blanching* and *White Plume* are good varieties. If a pink sort is desired, *Rose* will give good satisfaction.

CUCUMBERS.

Cucumbers prefer a light sandy loam well enriched. The rows may be five to six feet apart, and the hills three or four feet distant in the rows. In this locality June 1st to 10th is the time to plant. The striped beetle is very troublesome to the young plants. A good way to protect the plants is to grow them for a time under a cover of netting or wire screen fastened on a frame. When the plants are well started they will keep ahead of the insects. Seed should be planted every two or three weeks to provide a succession through the season. Plants will continue to produce fruits much longer if no cucumbers are allowed to ripen on the vines.

One of the best varieties to grow for general use is *White Spine*. There are several strains of this variety differing somewhat in growth, productiveness and in time of maturing. *Fordhook Improved White Spine*, Burpee, is one of the best of its class. The plants were very strong growing and productive and the cucumbers large and perfect in form. As a sort for

growing pickles and for early table use *Russian* is good. The fruits are small but are produced in large numbers. As a later variety *Long Green* may be mentioned. The cucumbers are large and among the best for table use.

LETTUCE.

A common mistake made in growing lettuce is in having the plants too close together. To reach perfection the plants should be ten to fifteen inches apart in the rows.

Lettuce is quite hardy and the seeds can be sown quite early. To provide a succession sow every two or three weeks.

As varieties for general growing *Black Seeded Simpson, Hanson, Grand Rapids* and *Prize Head* are among the best.

The following are sorts of recent introduction:

Onondaga, Burpee. It forms a large compact head. The outer leaves are curled, yellowish green with brownish red edges. The inner leaves are rich yellowish green in color and of excellent quality. It stands heat well and is a promising variety.

Iceberg, Burpee. *Ice*, Pitcher and Manda. The heads are of medium size; leaves somewhat curled and wrinkled, edges brownish red. Every plant formed a good head during very dry weather. Its handsome appearance, high quality and ability to withstand drouth make it well worthy of general planting.

SALSIFY.

This vegetable is of such easy culture and so little known that a few words in its favor may not be out of place. Sow the seed early in spring in drills. If hand cultivation is practiced the drills may be twelve or fifteen inches apart. The plants should be thinned out if they are growing too close. Late in the fall the roots may be stored in the cellar or a trench outside for use during the winter and spring. They may be left in the ground until spring without injury to the roots. The roots make a most excellent dish and the vegetable would be largely grown were its good qualities more generally known.

SQUASHES.

Of late the squash vine borer has made the growing of this vegetable somewhat uncertain, though a large proportion of the damage supposed to be done by the borer is due to a fungus which attacks the vine. Corn cobs soaked in coal tar and placed about the hills when the plants are small repels the moth that lays the eggs which produce the borer. The tar should be renewed every four or five days. The striped beetle may be kept away by covering the plants as recommended with cucumbers. A tablespoonful of turpentine mixed with a pailful of ashes and sprinkled on the plants early in the morning has been quite successfully used to keep away the beetles.

Summer Crookneck and *White Bush Scallop* are usually planted for early squashes. *Long Island White Bush*, a recent introduction, seems to be an improvement upon the usual type. The plants are very productive and the squashes larger, smoother and more regular in form than the com-

mon *Bush Scallop*. *Boston Marrow* is a good fall and early winter squash. *Hubbard* and *Marblehead* are among the best for winter use. *Essex Hybrid* is a productive sort and the squashes are of good quality; by some they are preferred to the *Hubbard* for fall and early winter use. *Cocoanut* and *Fordhook* are strong growing varieties which are almost sure to bear a large crop. The squashes are small, but of good quality.

Delicata, recently introduced by Henderson, belongs to the above class. The plants are strong growing and healthy. The squash is about six inches long and three to four inches in diameter. It is of a rich, creamy yellow color and the flesh is dry and of excellent quality. Matures the last of September. Somewhat similar to *Fordhook*, but is less ridged and more oval in form.

TOMATOES.

The seed was sown in the forcing house April 1. The plants were set out June 6 and 7. The rows were six feet apart and the plants set four feet apart in the rows. The trellis described in bulletin No. 57 was used

TABLE 4.—TOMATOES, TESTS OF VARIETIES.

Variety.	Seedsman.	Date first ripe fruits.	Yield of ripe fruits in August.		Yield from Sept. 1 to Sept. 12.		Yield from Sept. 12 to Sept. 25.		Total number of ripe fruits.	Total weight of ripe fruits.		Average weight of ripe fruits.	Weight of green fruit left on vines
			lbs.	oz.	lbs.	oz.	lbs.	oz.		lbs.	oz.	oz.	lbs.
Advance	Burpee	Aug. 14	26	5	20	6	25	5	561	72	0	2.00	22½
Acme	Gregory	" 30	8	14	12	8	21	5	200	42	11	3.41	12
Ignotum	College	Sept. 2	0	15	15	9	53	13	158	70	5	7.12	31½
Potato-leaf	"	" 2	1	2	30	9	30	9	141	62	4	7.06	81
Mitchell	Maule	Aug. 29			30	4	21	10	174	51	14	4.78	77½
Optimus	Berthoud	" 30			33	2	33	15	201	67	1	5.33	66
Lorillard	"	Sept. 6			37	2	46	9	258	83	11	5.19	82½
Ignotum	"	" 4			41	1	35	10	162	76	11	7.58	90
Potomac	Harris	Aug. 29	6	12	27	2	16	14	91	50	12	8.92	66
McCollum Hybrid	"	Sept. 2	0	13	11	10	11	7	80	23	14	4.77	51
Potato-leaf Ignotum	College	Aug. 16	15	1	32	9	11	1	138	58	11	6.08	51
Picture Rock	Childs	" 16	16	5	21	15	18	9	224	56	13	4.05	60
Climbing	"	" 15	6	3	21	6	12	12	140	40	5	4.60	25
Majestic	Buist	" 19	16	0	10	13	13	1	190	39	14	3.32	21
Prize Belle	"	" 22	7	11	12	11	22	9	168	46	2	4.39	36½
Royal Red	Dreer	" 26	8	14	9	6	15	15	156	34	3	3.50	28¼
Buckeye State	Livingston	" 30	0	13	13	3	22	13	84	36	13	7.01	52¼
Belmont	Gregory	" 22	6	7	21	0	15	12	168	43	3	4.11	42
Terra Cotta	Thorburn	" 30	5	8	29	14	31	10	206	67	0	5.20	51¼
Lemon Blush	"	" 26	5	7	36	6	23	11	171	65	8	6.12	50½
Early Michigan	Ferry	" 30	4	14	40	14	29	3	196	74	15	6.11	97
Nichol No. 5	Nichol	" 31	6	5	16	5	48	11	161	71	5	7.09	71
The Stone	Dreer	Sept. 4			4	7	16	0	37	20	7	8.84	108½
Trophy	Vaughan	" 2	2	15	22	1	18	5	74	43	5	9.36	81½
Richmond	Landreth	Aug. 12	18	11	8	9	15	1	180	42	5	3.76	30
Comrade	Gregory	" 16	17	0	13	15	8	4	274	39	3	2.25	20
The Shah	Henderson	" 22	8	4	10	12	9	12	96	28	12	4.79	25
Giant Tree	Salzer	" 22	9	0	40	7	4	14	147	54	5	5.91	55
First Ripe	"	" 18	7	6	18	12	11	10	130	37	12	4.41	35
Trucker Favorite	Burpee	" 22	6	12	40	7	14	13	184	62	0	5.39	50
Matchless	"	" 22	7	11	40	13	19	12	186	68	4	5.87	58
Red Ponderosa	College	Sept. 2	0	11	30	9	30	13	103	62	1	9.64	56
The Ever Fruitful	Pitcher & Manda	" 2	1	15	23	1	36	7	132	61	7	7.44	64

to support the vines. Ninety varieties or strains were grown. The table given below shows the time of ripening and the yield of a few of the older and better sorts, and of the new varieties grown. Six plants were set of each variety. All the ripe tomatoes borne on these six plants were picked and weighed. After the frost had killed the vines the green tomatoes were also gathered and weighed.

The variety which has given best satisfaction, as an early tomato, for several season is *Earliest*, from Vaughan. The six plants supposed to be *Earliest* in the experimental plot were not true, so that a comparison for this year could not be made. Our field planted for general use contained a large setting of *Earliest*, and here it was the first, by several days, to ripen fruits.

Advance, which is a little later than *Earliest*, but bears a smoother fruit, shows up well as an early sort.

Ignotum, *Lorillard* and *Optimus* may be recommended as among the best for the general crop.

The following notes on some of the new varieties may be of interest:

Royal Red, Dreer. Careful comparison could note no differences in plants or fruit from *Ignotum*, though *Royal Red* ripened fruits a week earlier and the tomatoes averaged much smaller in size.

Buckeye State.—Livingston. Plants are strong growing; fruit grows in clusters, is round and of good size, color a uniform pinkish red; flesh solid and walls thick. Free from rot and does not crack. Promising.

Belmont.—Gregory. Plants are strong growing and spread but little. Fruit round or somewhat oblong, many celled and cell walls very thick, few seeds in cells; color bright, light red, does not ripen well around stem.

Terra Cotta.—Thorburn. This is one of the *Rural New Yorker's* cross-bred tomatoes. The type is not fixed and the fruit varies greatly on the different plants. The typical fruit is of medium size, nearly round, with slight ridges or irregularities. It has very thin skin and the cells are close to the outside and have thin outer walls. The center of the tomato is solid and the flesh is bright red in color, juicy and fine flavored. A novelty in tomatoes and possessing many points of excellence.

Lemon Blush.—Thorburn. Another of the *Rural New Yorker* tomatoes. Plants of very strong, upright growth. Fruit of medium size, round, regular form. It has very thick outer walls, few cells with many seeds and the flesh is juicy and more acid than is usual for yellow tomatoes. Color a rich light yellow. A promising yellow sort and a distinct type.

Early Michigan.—Ferry. An improved type of the old *Red Apple*. Plants very vigorous, the branches growing in a close mass. It was not very early but the plants are very productive and the fruit is of good size, regular form, bright red color and free from rot or cracking. One of the best.

Nichols No. 5.—Nichols. A tomato of the potato-leaf type, but the plant grows stronger and more upright. Fruit a lighter pink and of more solid flesh. The plants are productive and the tomato an excellent shipper.

Richmond.—Landreth. Plants are not of strong growth. Fruit small to medium in size, rough and angular in shape and many celled. One of the first to mature fruits. Valuable for its earliness.

Comrade.—Gregory. In plant and fruit closely resembles *Advance*, though fruit is a brighter red and has more green around stem. Also some fruits are much larger than *Advance*.

First Ripe.—Salzer. Plants strong and of low spreading growth. Fruit

round, of medium size, smooth, bright red color; flesh solid, juicy and quite acid in flavor. Matures early and plants fairly productive.

Trucker Favorite.—Burpee. Plants strong growing and productive. Closely resembles *Acme* in plant and fruit. A valuable market sort.

Red Ponderosa.—College. Very similar to *Ponderosa* in plant and form of fruit but the color is red. Plants are productive and ripened a good amount of fruit before frost came.

Ever Fruitful.—Pitcher & Manda. Plants are strong growing and set a large amount of fruit. Fruit large, regular form and light red color; flesh not very firm but of good quality. No rot appeared and fruit does not crack around stem. Resembles *Ignotum* but the tomato is more spherical in form.

World's Fair.—Reed. This proved to be the old *Red Pear*, an early ripening sort of but little value.

AGRICULTURAL COLLEGE,
February 10, 1894.
9

THE EXTERNAL CONFORMATION OF THE HORSE.

BY E. A. A. GRANGE, V. S.

Some time ago the Veterinary Department issued an advance bulletin having reference to the external conformation of the horse, in which some scales of points were presented, and those interested were asked to make such changes as to them seemed proper and best. The hearty response which met the request has been most encouraging, while the replies furnish much valuable information, of which advantage will be taken when we come to that feature of this issue that bears upon scales of points.

Numerous communications have also been received commending the work of research upon the different styles of conformation met with in commercial horses of the present day, and many correspondents express a keen desire to be informed on all points in connection with the subject of this bulletin.

Before describing the points of the animal it may be well, first of all, to define the expression we so often hear, "*a good horse!*" and will do so by saying that associations have led us to regard *a good horse* as one which excels in many ways, fails in few, and is not remarkably deficient in any point. Of course that is treating the question somewhat broadly, for some horses are able to trot at a very high rate of speed, and are regarded as good horses by those who look upon speed as the chief feature in their ideal animal; yet these same animals may be affected with forms of unsoundness that would cause them to be rejected in any show ring, and the same may be said of horses used for the performance of any special duty.

I do not think it makes any particular difference where we begin with the description of a horse, for if we do the work thoroughly we eventually cover the whole animal; but as it has always been our custom, in work of this kind, to start with the conformation of the head we will continue in that line here; indeed, in some respects, the head may be regarded as the frontispiece of the animal, it being the feature above all others, which imparts the physiognomy or expression to the creature.

THE HEAD

may be divided for the convenience of description into the following regions, viz.: The ear, poll, forehead, face, nostrils, muzzle, mouth, cheek, eye, lower jaw and jowl, inter-maxillary space.

THE EARS (Plate II, Fig. 1–1) are situated towards the sides of the top of the head, and, like many other parts of the horse, are subject to differences of opinion in the minds of individual horsemen as to their proper size and shape, as well as their position upon the head. Some like what they call good large ears set well apart, while others prefer much smaller ones and made up in a more delicate manner throughout. As far as our own observation has gone, the ear which has most admirers is the one which is composed of a mere shell of gristle enveloped in a layer of thin skin, which should be clothed with a coat of fine hair, that may, however, be somewhat meagre on the inner surface, especially in the summer season.

In shape the ear should taper from the base to a rather sharp point at the tip; its movements should be energetic, but not of the quick, jerky order; they should not be slow or sluggish, because that would indicate a defect in hearing or the animal is quite likely to be a dull, stupid brute, while those with quick, jerky ears are liable to be vicious or ultra nervous creatures.

Experience in selecting horses has led us to observe the movements of the ear with much care, and regard them to some extent as the index to the animal's character, for they not only indicate a well-balanced disposition, a vicious or sluggish horse, as the case may be, but they point to defective eyesight, or even total blindness, in which case the ever restless ear will be thrown first in one direction and then in another.

The position of the ears upon the head plays an important part in the artistic appearance of it; if they are too near the center they cause a disagreeable, puny expression, while if they are too close to the lateral borders they give the head a somewhat coarse expression. When erect the ears should stand boldly up inclining in an oblique direction from below upwards and forwards; when they project in an outward direction, approaching the horizontal, they are called lop-ears, a style of conformation that is not admired.

THE POLL (Plate I–3) is situated at the top of the head (being covered in part by the arch formed by the headstall of the bridle or halter), its shape is not often criticised, though we occasionally meet with saddle horses that are injured from the artistic standpoint owing to the poll being flat and expanded, giving the upper superficies of the neck and back of the head a plain, coarse look, and as this feature is practically always under the eye of the equestrian, it is very liable to diminish the value of the animal in the high-class saddle horse market.

THE FOREHEAD (Plate II, Fig. 1–2) is that part of the head between the eyes, extending as high as the top of the cranium, the superior border affording a point of attachment for the forelock; the upper portion forms a large part of the wall of that cavity which contains the brain, while the lower portion forms the forehead proper, a space that is most admired when it is broad and flat.

Connoisseurs in horse flesh prefer plenty of space between the eyes and some even go so far as to say that a broad forehead is indicative of intelligence, but as this part of the bone does not cover the brain (the seat of

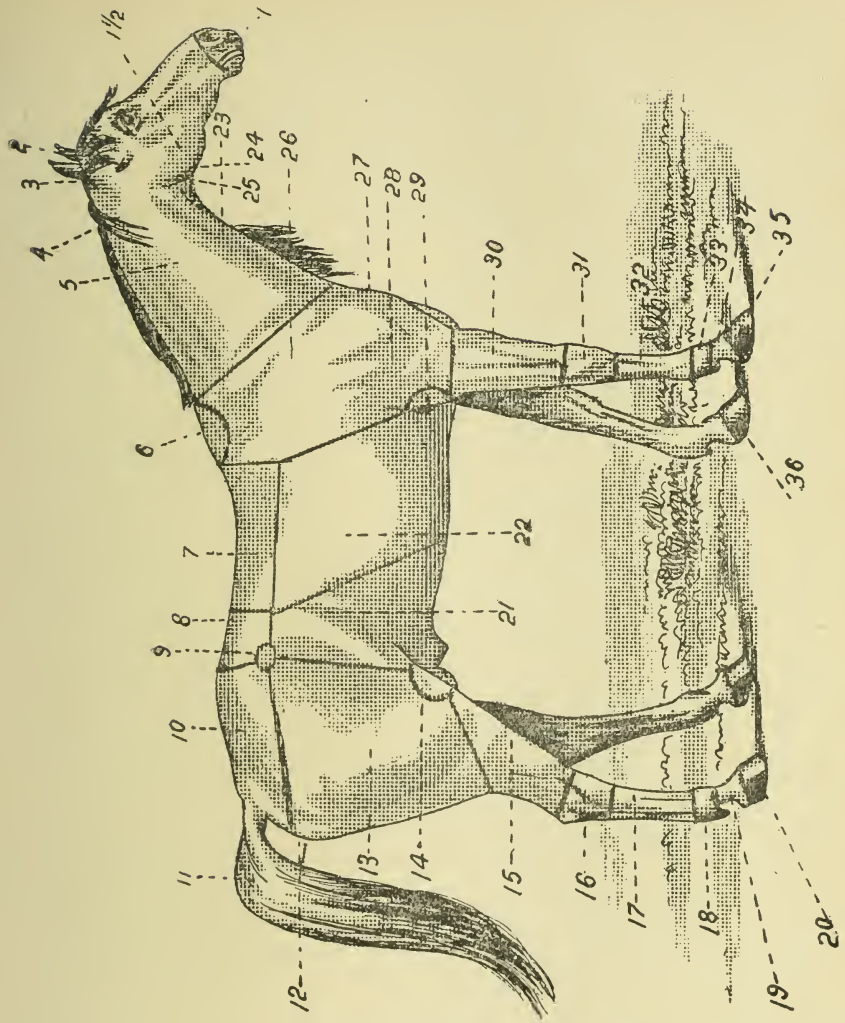


PLATE NO. 1.—REGIONS OF THE HORSE.

1 Muzzle.
1½ Cheek.
2 Crest of occiput.
3 Poll.
4 Crest of the neck.
5 Neck.
6 Withers.
7 Back.
8 Loins.
9 Point of hip.
10 Croup.
11 Dock and tail.
12 Point of quarter.
13 Haunch or upper thigh.
14 Stifle.
15 Gaskin or lower thigh.
16 Hock.
17 Shank.
18 Fetlock joint.
19 Hind pastern.
20 Hind foot.
21 Abdomen and flank.
22 Chest.
23 Jugular gutter.
24 Jowel.
25 Throat.
26 Shoulder.
27 Point of shoulder.
28 Arm (from point of shoulder to elbow).
29 Elbow.
30 Forearm.
31 Knee.
32 Front canon.
33 " fetlock.
34 " pastern.
35 " foot.
36 " coronet.

intelligence) it is hard to conceive how its shape can control such an important feature in an animal. When the space between the eyes is well developed that portion of the interior of the head to which the nerve of special sense of smell is distributed would naturally be larger in proportion, on that account the smelling power of the animal with the broad forehead may be increased, and if it be true, that the horse is capable of judging of the quality of things by their odour, we can then explain why the horse with the broad forehead and well developed organs of special sense of smell, may appear more intelligent than his less fortunate neighbour with the narrow one.

In some instances the forehead is convex in outline, a style of conformation which is not regarded with favor from an artistic point of view, though it is not likely to interfere with the animal from the practical standpoint.

The Face (Plate II, Fig. 1, 3–3) is the region situated below the forehead, the bones of the nose forming the principal part of it. The outline of the anterior aspect of the face should be straight or nearly so, causing the nose to be rather of the Grecian order, the sides of the face may be very slightly dished. The bones of the nose are often arched a style of confirmation that is not only unpopular, but in the extreme it may interfere with respiration during severe exertion, owing to the peculiar attitude the soft tissues, which form the nostrils, assume when hanging loosely from such bones, and their position makes it difficult if not impossible for the muscles which control them to act in a proper manner. Again the bones of the nose are sometimes concave, giving the animal a dish faced appearance, which in extreme cases may also interfere with respiration, by decreasing certain diameters of the nasal chambers, but it is only in very rare cases that the merits of the animal are affected by the shape of the nose; notwithstanding this, however, the shape of the nose is a very important point, for it goes a long way in giving a pleasing or disagreeable expression to the head.

The Nostrils (Plate II, Fig. 1, $4\frac{1}{2}$–$4\frac{1}{2}$) are the external openings of the nasal chambers; they are composed largely of a fine skin and cartilage or gristle, and lined by a delicate membrane which in health and during repose, should be of a rose pink color; exercise or disease alter the color of this membrane considerably. The openings should be large and easily dilated; if they are small and composed of thick tissues which do not dilate readily, the horse will most likely prove defective when it comes to severe exertion.

The Muzzle (Plate I, 1) of the horse is a region somewhat indifinitely spoken of as the end of the nose, but to define its limits I regard it as that part of the head extending from an imaginary line drawn around the lower portion of it and in its course passing over the angle or commissures of the mouth, all below this line to be included in the muzzle. The outline of this region does not seem to make any difference to the animal as far as its merits are concerned, but from the artistic standpoint it must not be coarse and expanded, but fine and inclined to be pointed; to express this, some horsemen say, the animal "should be able to drink out of a wine glass."

The Mouth splits the last region into two parts. It should be of moderate size, not deep enough to remind one of the mouth of an alligator, nor so shallow that it resembles the mouth of a sheep; it should be bounded, as it were, by moderately firm lips. We do not believe that its size or shape has anything to do with the general utility of the animal.

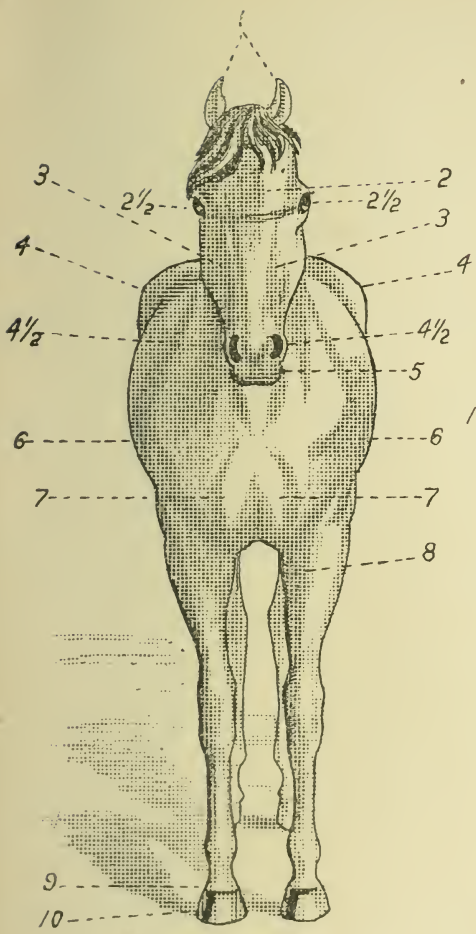


Fig. 1.

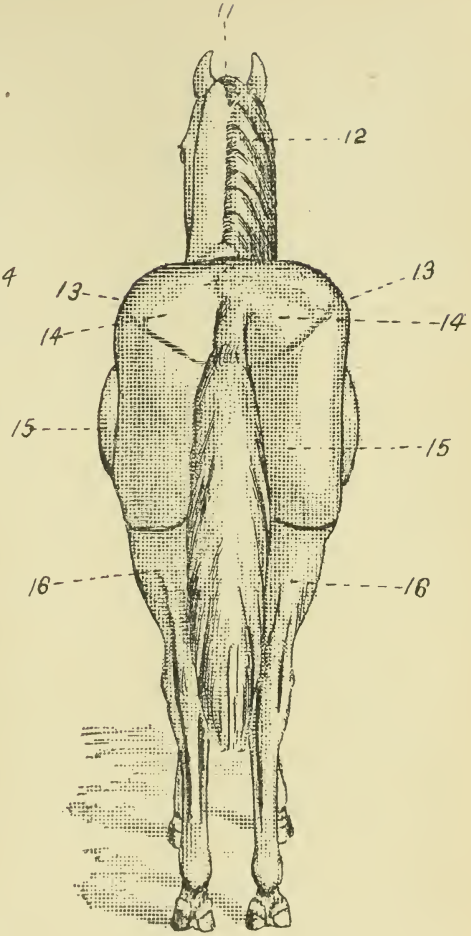


Fig. 2.

PLATE NO. 2.—REGIONS OF THE HORSE.

1	Ears.
2	Forehead.
2½.2½	Outside points of the forehead.
3.3	Face.
4.4	Points of hips from the front.
4½.4½	Nostrils.
5	Muzzle.
6.6	Points of shoulders.
7.7	Muscles forming breast or bosom.
8	Forearm.
9	Coronet.
10	Wall of the foot.
11	Crest of the occiput.
12	Crest of the neck.
13	Points of the hips from behind.
14.14	Croup from behind.
15.15	Haunch or upper thigh.
16.16	Gaskin or lower thigh.

THE CHEEK forms a large portion of the lateral aspect of the head. As we believe that this region of the head deserves more attention than it usually receives, a word or two concerning its anatomy may not be out of place here. It is composed of an outside covering of skin and hair, and an inside layer of a skin-like mucous substance called *buccal membrane*; between the skin and the membrane we will find two muscles, which are especially worthy of our attention. The first one, called the *Buccinator*, occupies that portion of cheek nearest the mouth, which is loose or flabby. This muscle is of interest because it is largely concerned in keeping the food in its proper place during mastication, by pressing it, as it were, between the molar teeth, which, figuratively speaking, are the mill stones that grind the corn, etc. The next muscle may almost be looked upon as being of more importance than the first, for again, speaking figuratively, it supplies the *power* which drives the mill stones; this muscle is called the *Masseter* (one on each side of the head) and is situated upon the upper or posterior half of the cheek. It is firmly attached to the upper and lower jaw and is the principal muscle of mastication, and as this is one of the important processes of digestion it must be thoroughly performed, or the animal will not remain vigorous and in a state of perfect health. We believe that imperfect mastication, or grinding of the food, is often the starting point of indigestion and all its evil consequences, hence that this act be properly performed, the masseter should be well developed, and we like to see them standing boldly out upon the cheek.

THE EYE is a most important part of the head. It is regarded as being defective from an artistic point of view when it is small and concealed, reminding one of the eye of a pig, or when it is too large, round and prominent, like the eye of an ox. It should be well developed, round and preferably of a brown color.

When there is an absence of the coloring matter of the eye, it will be very light colored, an appearance which usually goes under the name of (watch) *wall eye*.

The eye is frequently regarded as the index of the animal's character, but I have been deceived so often by both kinds, the mild as well as the sulky looking, that I am now disposed to think it is often over-estimated as a guide for future performances.

The acuteness of vision may be determined by making passes with the hand in front of the animal, in proximity to the organ, examining one eye then the other, taking care that too much force is not exerted, as currents of air may be produced which will cause the animal to blink, and this blinking mistaken for actual vision.

THE LOWER JAW is composed principally of a large bone, the front part of which forms a solid foundation for the implantation of the lower incisor teeth. This part is called the body, and springing from it are two large rami or branches; the branches turn suddenly upward towards the base of the ear, near which they form the joint of the lower jaw.

The angle of inflection is often designated the jowl (Plate I, 24). This point if coarsely constructed, through the bone being too broad, is sometimes taken exception to, and the animal criticised for being too thick in the jowl, or is occasionally called heavy-jawed.

THE INTER-MAXILLARY SPACE is the V shaped channel formed by the spread of the branches of the lower jaw. The channel should be deep enough to make its presence quite perceptible. When the groove forming the channel does not exist, owing to the space being filled with thick skin

or other soft tissue, the head has a beefy look, as it is called, a style of conformation that is rather disagreeable.

The inter-maxillary should be broad between the angles of the jaw in order that the top of windpipe (*the larynx*) may have plenty of room for its eccentricities in all attitudes of the head.

The head should be attached to the neck in a manner that a line drawn through the center of it will form a right angle with a line drawn along the center of the neck, when the animal is standing in its natural position. When the angle is more obtuse than a right angle, causing the nose to protrude, the horse always appears as if suffering from a sore throat; or if the angle is still more obtuse, it will resemble the attitute assumed in chronic poll evil; on the other hand if the angle be considerably more acute than a right angle the act of respiration may be interfered with during extreme exertion. A head that is not nicely set upon the neck deteriorates the value of a high class horse considerably, although it may not interfere with the merits of the animal.

It is somewhat difficult to say, in a general way, how the head of one class of horses should differ from that of another; all for instance are entitled to the fine ears, the broad forehead, the straight nose, etc., etc.; at the same time a course ear, which might be tolerated in a draft horse, would more than likely be taken exception to in the thoroughbred; then heads are course or fine in all breeds without apparently affecting the merits of the animal, but the same cannot be said of the neck which is the region of the horse next to be described.

THE NECK (Plate I, 5)

may be regarded as the part extending from the poll to the withers along its upper border, and from the throat to a point a little above the anterior extremity of the breast bone on the lower border. In all breeds of horses we meet with different kinds of necks that are named from their supposed resemblance to certain objects, but the kinds we oftenest meet with are the bull neck, the peacock neck, the ewe neck, the straight neck and the clean cut neck.

In selecting a horse the form of neck must be taken into consideration, and the kind of work the animal is to be engaged in, before we pronounce upon it as being good or bad in form.

THE BULL NECK is the one which is strikingly short and thick; it is usually credited with being indicative of strength and consequently is best adapted for draft horses, but even in them it is doubtful if it is advisable to encourage the breeding of horses with short necks, for innumberable draft horses have been brought under our notice with moderately long necks and we have yet to learn that they were deficient in strength when it came to the starting of a load. The bull necked horse would certainly not do for saddle purposes because he would not be graceful in his movements, and men who ride high class horses, like them with plenty of rein, in order that they may be handled in a more agreeable way; it is not a pleasant thing to have the horse's head too near you when in the saddle.

Those who drive generally prefer the rangy neck to the short variety for similar reasons.

THE PEACOCK NECK is one which usually has many admirers; the name is given to it from the supposed resemblance to the neck of that bird. The style of conformation is occasioned by the upper border of the neck (*the*

crest) becoming somewhat elevated or unusually prominent about six inches from the poll; they are found in all kinds of horses and, while they do not indicate anything of special value in the line of merit, they are coveted on account of their beauty.

THE EWE NECK is one in which the upper border is concave instead of being convex and the lower border bulges more or less, giving rise to the expression, "that neck is upside down." Many good horses are formed in this way, though it is a form that is often objected to, more from its appearance than anything else we are aware of.

THE STRAIGHT NECK is one in which the upper and lower borders are practically straight, tapering gradually from the chest to the throat; we find this style both in good and bad horses.

THE CLEAN CUT NECK is the one our preference leans towards; in it the muscles and other parts stand boldly out, the crest is prominent and whip-cordy or wiry, the sides are marked by hard muscles, the lower border including the wind pipe, stands out perceptibly leaving a prominent groove, the jugular gutter, between it and the neck above, gracefully incurvated near the throat and attached to the head in a manner that leaves a line of demarkation between the leaving off of the head and the beginning of the neck, doing away with the appearance of a *plastered on* head. The posterior part usually terminates perceptibly just in front of the withers, so that one can tell where the neck leaves off and the withers begin, a point that is not always easy to determine.

Necks of this nature are usually accompanied with a constitution that can stand a good hard day's work either upon the road or at the plow.

THE BODY

is the next division of the horse to be considered, and in order that it may be discussed somewhat in detail it is conveniently divided into the withers, the back, the loins, the croup, the chest and breast, the abdomen; other parts which may be looked upon as part of the body are left to be considered with the limbs.

THE WITHERS (Plate I, 6) is that elevated portion at the top of the shoulder, the highest part of which is the point to be selected when measuring the height of an animal. They are usually described as being *high* or *low*; the latter variety, however, is we believe, more apparent than real, as the length of the bones which form them does not vary as much as one would at first be led to suppose. I have in my possession at this writing a mare, which six months ago was so high? in the withers that a pad had to be arranged under the pommell of the saddle to prevent it from bruising those dainty parts; at this time she is ridden every day with the same saddle (which has not been repadded) and there is abundance of room between the top of the withers and the under surface of the pommell of the saddle; her withers look lower, but there cannot be any doubt but what this appearance is to be accounted for by the increase of fat in the animal's condition. We think a good substitute for the expression high and low withers would be, *well defined* or *obtuse* withers, the former taking the place of the expression "high" the latter of the expression "low" we do not pretend to say that the comparative length of the bones do not vary, but that the variation is not so great or so common as is generally supposed.

Horses with high withers, whether they be well defined or obtuse, are able to perform rapid movements with more grace and facility, other things

being equal, than those in which the bones are short, making the withers *really* low. This is to be accounted for by the fact that the long arm of a lever (the trapezius muscle) is made longer, and hence its power to swing the shoulder blade backwards and forwards, like the pendulum of a clock, is made greater, but with short bones, not obtuse or rounded withers, this leverage is diminished to a greater or less extent. We are inclined to think that the view we have taken accounts for some horses which look as if they were low in the withers, and are still able to trot and perform other rapid movements with the greatest facility, and that in them the withers are really high but they do not look so, because they are obtuse, and not well defined.

In the selection of an animal, the style of the withers should be well considered. When a saddle horse is to be judged the withers should be well defined in order that the saddle may sit comfortably upon the back. Horses with obtuse round or low withers do not carry the saddle nicely nor its occupant in a comfortable manner, as there is a good chance for the saddle to role or become otherwise misplaced.

If the coach horse or roadster is under consideration, then those with round withers are not so objectionable, but the low variety, that is those with short bones, are not desirable, unless the action of the animal is such as to warrant them.

In draft horses there is no objection to low withers, though in a general way horses with this part well defined are usually most admired.

It is not an uncommon thing in stallions to find all appearance of the withers obliterated on account of the neck coming down into the middle of the back, as it were. Yet such animals are quite liable to produce offspring with well defined withers.

The Back (Fig. I, 7) is that part of the animal extending from the withers to the highest part of the croup, a point formed by the approximation of processes belonging to the haunch or edge bones, the posterior third (approximately) of the back forms the loins, or coupling, as it is sometimes called. Some writers describe the *back* and *loins* as separate parts, but it always appears to the writer that the latter is only a continuation or part of the former, for when we come to consider roach and hollow backs, we find the anterior and posterior part of them so intimately concerned in the peculiar conformation that it is somewhat difficult to tell where one begins and the other leaves off; that is in the living creature, though in the skeleton the line of demarkation is well marked, so much so, that there is good reason for those who prefer to describe them as separate regions to do so.

In selecting a horse the uses the animal is intended for must have due consideration before the back is pronounced upon as being desirable or otherwise; for instance, a horse with a tolerably long back may look well in harness, while the same creature would look entirely out of place under the saddle.

Our experience in saddle horses has led us to prefer those with short backs and strong loins with a gentle dip, not sufficient to come under the head of *hollow back*, but enough to do away with the *straight edge* appearance. The dip we wish to emphasize should be very slight and more apparent as we approach the withers.

Roach-back horses are not desirable for saddle purposes, because in them the gait is usually rough, producing a degree of concussion upon the rider which is unpleasant, to say the least of it.

The horse with the hollow back is often graceful in its movements, and on that account is agreeable to ride, but the style of conformation is not admired and the deformity is liable to increase with age, and more rapidly if weight is applied to its surface.

When the back of the saddle horse is short and loins broad, it is well adapted to carrying weight, and its various evolutions can be performed with the greatest facility, the broad loins giving plenty of room for the attachment and development of one of the largest muscles in the body, which extends, one on each side of the spine, through the regions of loins, back and withers, and is concerned in nearly all movements of the body. We can scarcely conceive an animal doing a good day's work in the saddle, at the plough, or on the road, if this muscle is not well developed.

For harness purposes the back may be somewhat longer. The moderately long horse has a more or less rangy appearance in harness that is often admired. If an animal is intended for fast, or even moderately fast road work, the back should then be of about the same conformation as that of the saddle horse.

For draft purposes the back which has most admirers is the one which is rather short but broad and straight.

The Croup (Plate I, 10 and Plate II, Fig. 2, 14-14) is that part of the upper surface of the body extending from the highest point of the hind quarters to the dock, and embraced between two imaginary lines drawn from the point of the quarter to the point of the hip, one on each side. When the croup is long it shows that the bones forming the foundation of it are long, thus giving plenty of room for the development of those powerful muscles which are often spoken of as the propelling powers of the animal. We give the preference to the horse with the long croup. The slope of the croup is another point which should engage our attention when studying the external conformation of the animal; many persons believe that the drooping quarters are indicative of speed, and while it must be admitted that many fast horses are so formed, yet so many record-breakers are built on the more horizontal plan, that we are forced to believe that the slope of the croup has little to do with the animal's merits, but it certainly has with the beauty of the creature, for when it approaches the horizontal, that is just slopes a little, the tail comes from the body in a manner that admits of its more graceful and elegant carriage, which gives a finish to the contour of the whole animal that is a striking contrast to the indifferently carried tail of the drooping croup, with its low set dock.

In those horses with slanting or very drooping croups the tail usually comes out low down.

The Dock (Plate I, 11) or root of the tail is a part which should always be observed when examining a horse, and the animal required to perform in its various paces, then the examiner can readily judge if there is anything radically wrong with its carriage or shape.

Many persons regard the resistance offered by the muscles of the dock when, for instance, the crupper being applied, as an index of the animal's strength and endurance, and it does seem that stiff docked horses are generally good ones, yet we have seen so many limber docked animals which were capable of performing in a most satisfactory manner, that we would hesitate in condemning the horse with the limber dock without some further evidence that it was an inferior animal.

The Thorax (Plate I, 22) or chest is a region which is of great importance from every standpoint that a horse is judged, and it usually bears a

somewhat close relation in shape to the kind of work nature has intended the animal to perform. For a familiar example of this we have only to look at the chest of the greyhound to see what a striking contrast it presents with his more surly neighbour, the bulldog, or observe the difference between the shape of the thorax of the English thoroughbred and the Scotch draft horse. In the former we find it deeper from above downwards and comparatively narrow in the bosom ; his admirer tells us that he likes 'em deep through the girth ! While the connoisseur in the draft class must have them with a good broad breast, with a large full bosom and fore legs well apart. We must not forget, however, that this narrowness of chest and fullness of bosom is modified a good deal by condition, and probably does account to a considerable extent for the well trained and thin race horse being able to gallop with such ease and precision, when the same animal if fat would go awkwardly in comparison. Our observation has led us to believe that the narrow chest, that is comparatively narrow, is more essential to the fast, easy stride of the galloping horse than it is to the trotter ; but we do not admire any horse whose front legs, to use a horsey expression, look as if they "came out of the same hole."

The shape of the entire chest, apart from the front legs and muscles connecting them to it, has been aptly compared to a truncated cone with its apex turned forwards and the truncated or cutaway part following the line of the lower extremities of the floating ribs. The ribs form a large portion of the bony frame work of the chest, and to them it largely owes its shape. There are usually 18 pairs of them, which vary considerably in size and shape in all animals, whether they be draft or saddle horses, and it is generally conceded that the merits, as well as some peculiarities of the individual, depend upon the shape and length of them. The first few pairs, those that are underneath the shoulder blade are rather straight, and those behind it are somewhat bent. The ribs increase in curvature from the first pair, which are nearly straight, to the last pair, which are so much curved that they describe a considerable portion of the circumference of a circle ; they increase in length from the first to about the ninth pair, and from this pair to the last they get shorter ; it is this progressive shortening which gives the truncated appearance to the osseous walls of the chest. The ninth pair of ribs, being longer than the rest and being situated where they are, gives depth to the girth, the point that is so much admired, especially in horses used for any saddle purpose.

Professor Williams, one of our eminent veterinary authorities, says that "shallow chested horses are prone to heaves." In all horses the ribs should be well sprung, or have a well defined angle; that is to say, from about the 7th or 8th pair backwards they should come out from the spine in a manner approaching the horizontal, then dip downwards and soon recurve inwards, towards the central plane of the body. The angle is the part where the rib dips downwards, and when it is well defined it is a good point for several reasons; in the first place it shows that there is plenty of room for the implantation of that large muscle (*longissimus dorsi*) already referred to when speaking of the loins, then the angle does away with the flat sides so often found in washy, delicate creatures. The ribs are considered well arranged when the distance between the last one and the point of the hip is little more than the breadth of a hand, such animals are said to be well ribbed up; but when this space is considerable, the horse is spoken of as being loosely coupled, which is frequently associated with narrow loins, the two together producing a style of conformation that is

seldom fit for a good hard day's work in any capacity, while the horse that is well ribbed up, other things being equal, is usually able for anything that it may be called upon to do, probably the secret is, that in such horses the chest is well formed and spacious, giving the heart and lungs plenty of room to perform their various functions with ease and comfort.

THE ABDOMEN varies perhaps more than any other part according to the feed or natural condition of the animal. Some animals are always very full owing to the actual size of the organs contained therein. When the dimensions are very large they spoil an animal's appearance to some extent and, on the other hand, we occasionally meet with horses that will not fill up always appearing tucked up in the flank; such animals are often poor feeders and consequently not able to do a hard day's work.

THE SKIN should be supple and loose, having an abundance of little glands whose presence and healthy condition are indicated by the glossy appearance of a well groomed coat.

THE FORE LEG is situated upon the front part of the side of the chest, or rather that part of the leg above the elbow joint, and in a general way it responds to the six anterior pairs of ribs.

That part of the shoulder which extends from the point in an upward and backward direction to within a short space of the top of the withers, is the portion which deserves closest scrutiny when examining the conformation of an animal, for by the incline in the anterior surface of this region we are able to tell, with more or less certainty, what kind of action the animal will have as well as judge it in some other particulars. We cannot call to mind ever having ridden a horse with straight shoulders that was an agreeable animal as far as its gait was concerned. Horses so formed are invariably rough and stilty in the trot, and when it comes to the slow gallop they "go short" and get too far away from the ground in the stride, which is so marked in some individuals that it approaches the bucking gait, and is very different from the elastic graceful movements of the horse with oblique shoulders.

For heavy slow coach work the straight shoulder answers very well, but they are best adapted for draft purposes where the horse is seldom required to go off the walk; in this latter class the entire surface of the front of the shoulder will be flush against the posterior or draft surface of the collar, and when an animal so formed throws his weight into it (the collar), the creature will most likely feel comfortable and every effort to move the load will have, comparatively speaking, greater influence. It is not to be inferred from what has just been said that horses with oblique shoulders cannot pull and pull well; or that horses with straight shoulders cannot perform fairly well upon the road in light vehicles, but other things being equal they are best adapted to the uses assigned to them. Though for saddle purposes the parts must be oblique to modify or dispose of concussion. The space between the point of the shoulder and the elbow joint is sometimes called the arm. We do not know of any special style of conformation that needs description in this region as it is invariably formed in an acceptable manner, but below the elbow joint the leg should be thoroughly examined, and first of all we have the forearm (Plate I, 30) to take into consideration. This should be formed of well developed hard muscles standing boldly out. The circumference of the arm as measured with the tape line is not a good guide to the merits of the creature, for two reasons, in the first place when we come to measure horses by the scores, we will find in some of them, that the pectoral muscles which are concerned largely

in binding or attaching the fore leg to the body, are (some of them) attached to the inside of the fore leg, just about opposite the elbow joint, while in some individuals this attachment appears lower down; so much so, that it will be included in the tape line when measuring the part, and as this muscle is not regarded as one of the muscles of the fore arm, it seems unfair to include any of it in the measurement of that part. In the second place the skin of some animals is thicker than that of others, while a species of second skin, that binds down the group of muscles which enter into the formation of the fore arm and called *fascia* by anatomists, is considerably denser in some than in others; again fat is found filling up the parts, so as to make them appear larger, while the muscles themselves may be somewhat poorly developed; but where we find individual muscles standing clearly out by themselves, that is with slight depressions between them, amounting in some instance to grooves, and when they are firm, cordy as it were, to the touch, we may be tolerably certain that such muscles are composed of good tough fibers that can stand the strain and are consequently well developed.

It may not be apparent to all why it is so essential for a good horse to have a well developed arm, but when we come to examine those instantaneous photographs, so common in these times, we will at once see that much depends upon the perfect action of the arm in order that the pace may be continued in anything like a harmonious manner. It will be seen in Plate V, Fig. 2, that at certain stages of progression the entire weight of the body is upon one fore leg, and that the muscles of the fore arm have to carry it over a center as it were, something in the same manner as the athlete progresses with a leaping pole,—the horse must be landed on the other side of the center in a firm, steady manner in order that the next stride may be performed in anything like a proper way, for let anything interfere with the action of these muscles and the next step is so modified that it is far from perfect. We have this often well illustrated in the horse suffering from, we will say for convenience sake, a corn ; the animal steps upon something, a small stone for instance, that causes undue pressure at the moment the entire weight of the body is upon the foot, or just as it is about to pass over the center, this undue pressure causes pain which shoots through the whole leg, this causes the muscles of the fore arm to wince and the weight is not carried over the center and landed on the other side in a proper way, and the animal comes down upon its knees or stumbles along in a somewhat awkward manner, if it does not fall down all together.

It is generally conceded that horses with long arms are best adapted for fast work, and it is so often referred to as a point of excellence in the trotter that we were led to measure a large number of horses to determine if possible whether any reliable information could be obtained from the length of the arm and its relation to speed, and our measurements go to show that the length of the arm (from the elbow to the trapezium) is greater in the roadster, proportionately speaking, than in the draft horse. This will be readily seen by referring to the measurements in the table which is to be found further on in this bulletin.

Passing on down the leg we come to the knee (Plate I, 31), this should be nearly straight as far as the outline of its anterior surface is concerned, but the posterior surface is marked by a prominent eminence which does not receive any special name except *the prominence* at the back of the knee. This prominence is far more perceptible in some horses than it is in others, so much so that it stands out boldly behind, and below this point

the contour of the back of the leg dips suddenly forward, giving the part a cutaway appearance, and good horses are sometimes condemned for being too much cut away under the knee, when the part is really stronger and better formed than the average. It is true that many horses are cut away under the knee to that extent that the leg is weakened, and will not stand the constant "hammer, hammer, hammer on the hard, hard way," but we must distinguish between the horse with an unusually well developed (trapezium) bone which forms the prominence and the one which is illy formed by being too much cut away under the joint. In the former the condition is more apparent than real, for if we observe the substance of the leg from before backwards just beneath the knee we will find it broad and strong, presenting a striking contrast to the latter, which will be found shallow to that extent that it often becomes a weak link.

The knee should not bend backwards or present a concave appearance upon its anterior aspect, as this produces a condition called *calf kneed*, a style of formation that is much objected to from the artistic standpoint. Neither should the knee bend forward, as such a condition is indicative of its having been exposed to harder work than the tissues forming it could withstand, though we occasionally meet with horses that are over in their knees, and yet able to do a hard day's work without being materially affected, but such joints have a weak appearance and are consequently unpopular.

Between the knee and the fetlock we have a part familiarly known as the canon (Plate I, 32), it is composed principally of the large canon bone in front, with tendons, called the back tendons, behind. In shape it should be flat from side to side, the back tendons should stand boldly out behind, leaving an evident line of demarkation between them and the front part of the region, they should be hard, almost bone like, to the touch, and free from all puffiness. The posterior part of this region may or may not be clothed with long hair, according to the breed or fashion of the times. The skin covering the tissues should lie close to the bone and tendon, producing the sensation when handled that all is skin and bone. Below the fetlock joint and above the hoof we have a region designated the pastern, which is a most important part of the leg, it being the seat of that very troublesome disease, ringbone. Besides examining this part for disease we should regard its shape and direction according to the uses the horse is intended for, and if it is to be used as a saddle horse the kind with long oblique pasterns are more elastic and graceful in their movements than the short upright sort, which are often unpleasant to the eqestrian on account of the concussion produced by the more or less upright columns of bone. Our experience has been that we usually find straight shoulders in horses with upright pasterns. In horses used for heavy coach or draft purposes the pasterns may be comparatively shorter, stouter and more upright than those used for saddle or light road work, but very straight pasterns are not desirable, in our opinion, in any class on account of the concussion they are liable to produce, but even the long oblique kind may be, and often are, overdone ; in them the strain upon the parts is liable to produce an irritation that in its turn will cause ringbone.

The pasterns of the fore leg are usually a little more upright than those of the hind leg. This being the case we think it one of the reasons why ringbone is more prevalent in the hind than the front pasterns.

Continuing down the leg we eventually come to the foot, a region which has been given a great deal of consideration in all ages and by most writers

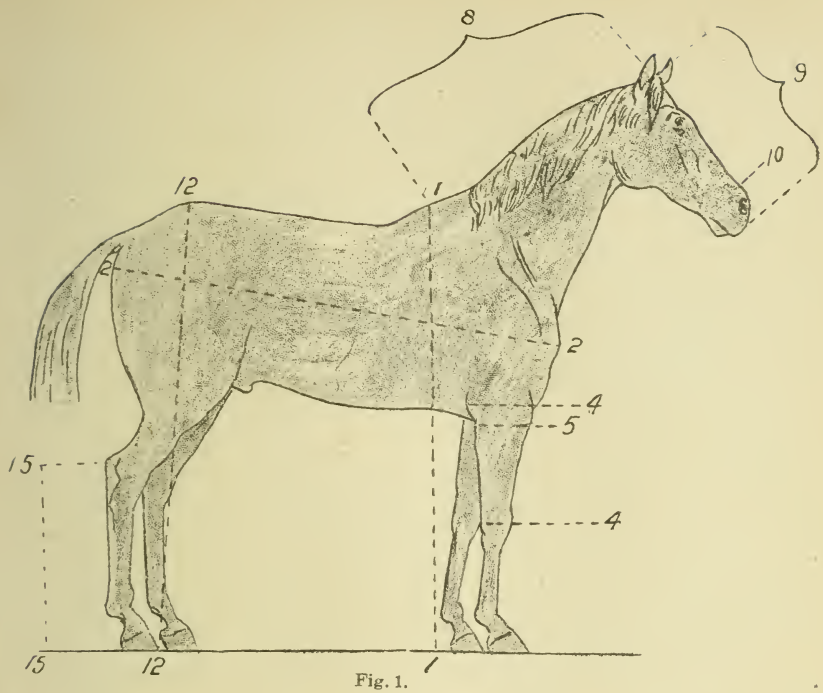


Fig. 1.

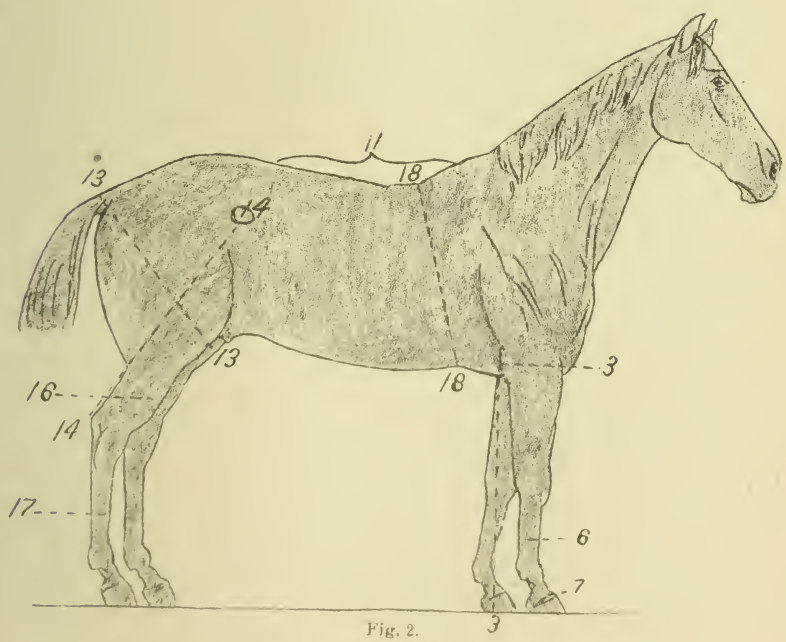


Fig. 2.

PLATE NO. 3.

Points which are measured from and to, are indicated by the numbers on the above figures.

FIG. 1.

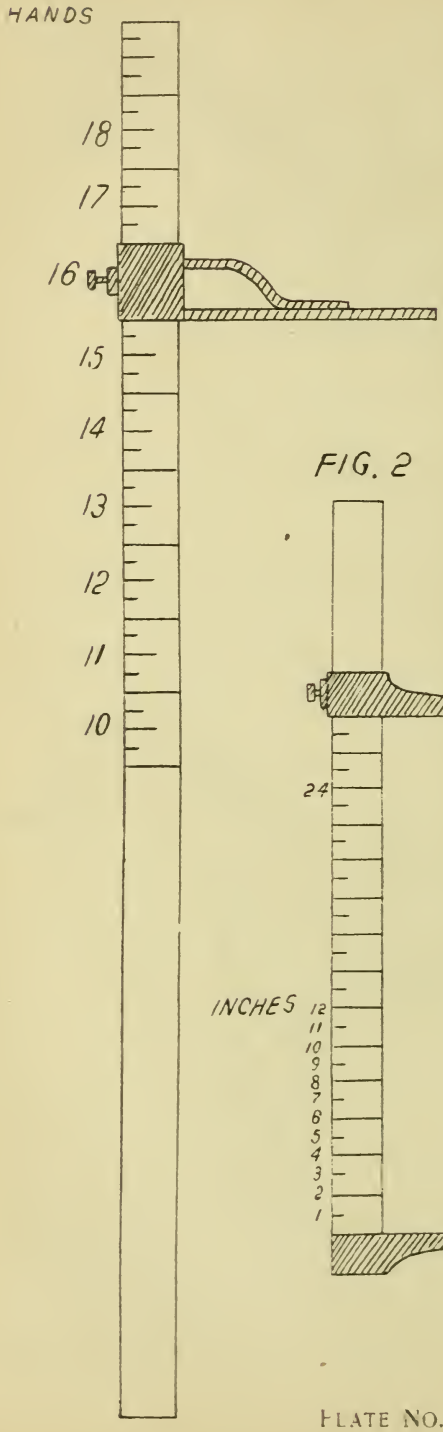
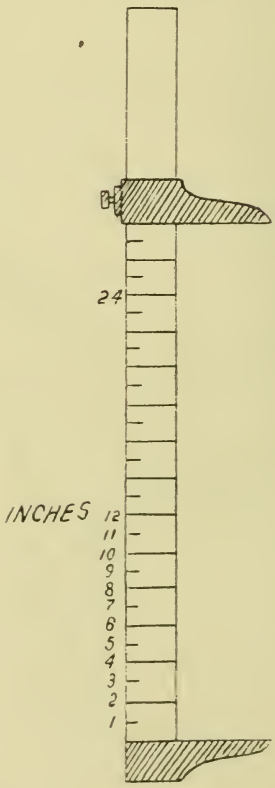


FIG. 2



CONVENIENT FORM OF INSTRUMENTS FOR MEASURING HORSES.

The height of a horse is usually measured in hanes, a hand being four inches, 15 hands being just 5 feet, or 60 inches. Fig. 1 is convenient for measuring the height at the withers and croup; Fig. 2 for measuring the width of chest at shoulder points, width of hips, width of forehead and length of head. Other measurements are more conveniently made with an ordinary tape line.

PLATE NO. 4.

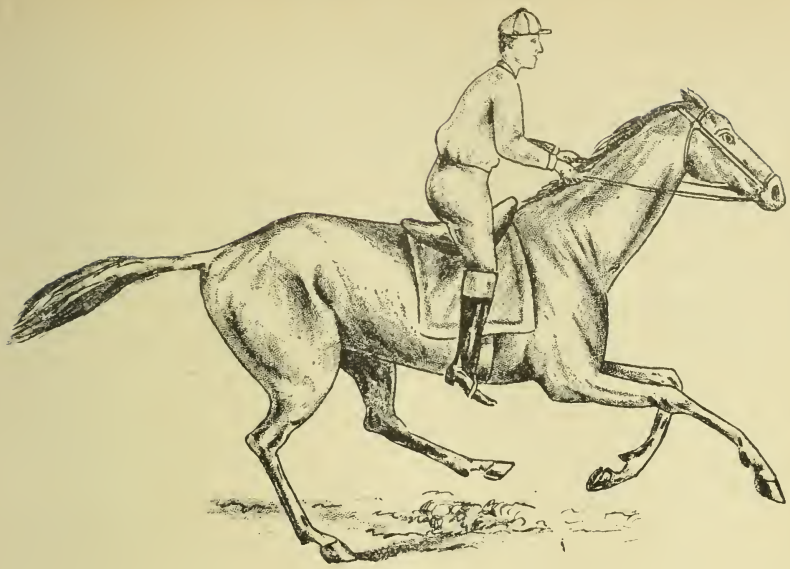


Fig. 1.

From an instantaneous photograph. Horse in rapid progression, the entire weight of the body being on one hind foot.

Fig. 2.

PLATE NO. 5.

From an instantaneous photograph. Horse in the act of rapid progression, the entire weight of the body being on one fore foot.

upon equine topics; indeed it is doubtful if there is any one space in the whole animal which receives so much attention. We hear the expression "no foot no horse" wherever we go, showing in some measure that a good foot is held in high esteem by all admirers of a well formed animal, and a horse with a badly formed one is often dubbed a plug or a screw in the stable lore of the present age.

The expression is so common that we have endeavored to trace its origin, but have failed to discover the exact source from which it came, so we have concluded that from its being such an old saying it must have originated long before iron shoes were used, and in those days people did a large part of their traveling upon horseback; under such circumstances, with an unshod horse, it does not seem unreasonable to suppose that the horse's hoof would wear out on a long journey, and the creature soon become tender as well as lame and eventually unable to travel; the rider would naturally look for the cause of the animal's inability to progress in the usually way, and on examining the foot and finding it worn out, *gone as it were*, might he not very appropriately exclaim "no foot no horse!" because he would have to abandon that animal, for that journey at all events. When we come to consider what a number of diseases attack the foot, and what a large majority of the cases of lameness which we are daily brought in contact with, have their origin in the foot, we can begin to realize why this part should be regarded as being of so much importance, and the study of *Pedology* or science of the foot, so interesting to those who are engaged in any way in the equine industry.

The Foot (Plate I, 35) may be regarded as that part embraced by and including the hoof, the upper border of which is called the coronet (Plate I, 36). We find on comparing the front feet with the hind ones that the former are usually if not always larger and flatter. This is no doubt owing to the fact that they have to bear more weight; in some horses considerably more, for instance the actual weight of a Shire stallion, as I took it, was 1580 lbs.; the front feet were then placed upon the scales and brought the beam up at 940 lbs.; the animal was then reversed and the scales indicated 634 lbs., showing a difference of about 306 lbs. Several other ordinary farm horses were handled in a similar manner with the following results, to wit:

No. 1, a gelding, entire weight, 1180 lbs.; front quarters, 690 lbs.; hind quarters, 510 lbs.; difference in favor of the front quarters, 180 lbs.

No. 2, a mare, entire weight, 1280 lbs.; front quarters, 720 lbs.; hind quarters, 560 lbs.; difference in favor of front quarters, 160 lbs.

No. 3, a gelding, entire weight, 1220 lbs.; front quarters, 660 lbs.; hind quarters, 552 lbs.; difference in favor of front quarters, 108 lbs.

No. 4, a gelding, entire weight, 1150 lbs.; front quarters, 630 lbs.; hind quarters, 510 lbs.; difference in favor of front quarters, 120 lbs.

The slight discrepancy, in those cases of the foregoing between the entire weight and the sum total of the front and hind quarters, is no doubt owing the displacement of the center of gravity in the different attitudes, which could scarcely be controlled. When the animal rests with its foot upon the ground the part we see is called the wall (Plate II, Fig. 1, 10); it is composed of innumerable horn fibres, which run parallel to each other, and are held firmly together by a tenacious substance peculiar to the part. The external surface of the wall should be smooth and free from grooves or fissures running in any direction; in outline it should be circular upon its lower border, having a somewhat smaller circumference at the upper or

coronal edge. The wall should be moderately deep and strong ; if shallow the foot will be flat, a variety which is sometimes a perpetual nuisance on account of often being affected with corns. The wall should not be contracted at the heels, as this form is usually associated with coffin joint lameness or some other chronic disease of the foot. The sole of the foot should be concave rather than flat, and that pyramidal shaped cushion, the frog, which appears as if let into the sole behind, should be well developed. The circumference of the well formed foot is to be found in the table of measurements further on.

The hind feet are invariably smaller and their soles more convex than the front ones; lameness in the hind foot is of comparatively rare occurrence. Many persons believe that feet with dark colored horn are stronger and able to stand the wear and tear of hard work better than the light colored ones, but our experience has failed to demonstrate the truth of this idea. The white foot will show the invasion of the part by inflammation more perceptibly, which we think is the cause of disease often being noticed in the white one when a similar complaint would, and often does, pass unnoticed in the dark colored foot.

THE HIND LEG.

The Haunch or Upper Thigh (Plate I, 13, Plate II, 15-15) is a region that is somewhat difficult to define as far as its exact limits are concerned, for we find it running imperceptibly into the croup at one extremity, and into the gaskin or lower thigh at the other, so we will have to draw a little upon our imagination and say that it is situated between two lines, the one drawn from the upper part of the point of the hip to the upper part of the point of the quarter, the other drawn from the stifle joint in an oblique direction downwards and backwards following the lower border of the prominence formed by that large superficial muscle on the outside of the leg (Plate I, 13). In examining horses as to the excellence of the haunch we should first of all see that the muscles stand boldly out. In the horse where these muscles can be recognized independently of one another, we usually find an animal that possesses a good deal of strength and endurance. Then we should view the animal from behind to see that the hips and quarters are broad. Broad hips are not only indicative of strength but are an immense advantage to the brood mare in the act of foaling, because they indicate a large passage for the foal to pass through, consequently the act of labor can be accomplished with more ease and less risk.

The Gaskin or Lower Thigh (Plate I, 15, Plate II, Fig. 2, 16-16) is the part below the haunch and above the hock ; it is important that the anterior and external part of it be well developed, because that part is composed of a group of muscles which are concerned in carrying the body past a center under certain circumstances. If we examine other instantaneous photographs (Plate V, Fig. 1) we will find that in certain attitudes of progression the entire weight of the body is upon one hind foot, and these muscles are largely concerned in throwing it off or carrying it past the center, hence the necessity for a good horse to have a lower thigh composed of tough, hard muscles, and if they stand boldly out all the better, for then the region becomes more attractive.

The Hock (Plate I, 16) is a very important joint situated between the lower extremity of the gaskin and the upper end of the shank bone. It has been said that a large majority of cases of lameness in the front legs

were due to some disease of the foot, but this order of things is generally altered when we come to the hind legs, in them the origin of most cases of lameness, in our experience has been in the hock joint, and unfortunately the lameness is very often of a most intractable nature as far as yielding to treatment is concerned, unless it is judiciously dealt with in the very earliest stages; hence the necessity of selecting animals with well formed hocks. The variety of hock which gains most favor is the one which is deep from before backwards and broad from side to side; the skin should be in close contact with the hard tissues underneath, doing away with that soft meaty appearance we sometimes meet with. The superficies of the joint should be free from large soft puffy tumours, especially after the colthood days. The hock joint being of so much importance (as it is so liable to become affected with disease), it may be an advantage to the student to make a few suggestions here as to methods of examining it, for which purpose it is very convenient to regard the joint as having four surfaces—front, back, inside and outside. To examine the part thoroughly, both hind feet should be placed together, and in line as we view them from side to side; the examiner should then stand, say three feet out from the point of the shoulder, and make an ocular examination of first one joint, then pass to the other side of the horse and examine the other; in doing this care must be taken to see that both joints are alike, especially at that point where the front and inside surfaces seem to meet. If we find a prominence in one that does not exist in the other we may be tolerably certain that a bone spavin exists in the one with the prominence. In some instances it is difficult to make up the mind by this method, in which case an examination made from between the fore legs looking backwards, and examining first the inner aspect of one nock then the other in quick succession, this will sometimes help us to determine with tolerable certainty; if we are still in doubt, we may get an assistant to hold up one front foot, and manipulate the joint with the fingers, using the eyes at the same time. Should the part be thickly clad with long or furry hair, saturate the surface with water, which will cause the hair to lie close to the skin, and this will sometimes reveal enlargements which would otherwise pass unnoticed. It may be advisable to saturate the hair of both hocks. The saturation of the hair of the parts answers very nicely in examining the pasterns for ringbone or other superficial diseases dependent upon a certain amount of enlargement in any part of the body, if the hair is long. While the assistant is holding the fore foot from the ground, the front of the hock may be examined for that soft puffy tumor known as *bog spavin*, and the sides of the joint for *thoroughpin*; at the same time the outline of the back of the joint may be scrutinized to see if any remarkable deviation from a straight line exists in one hock that is not in the other; if it does, the probability is that a *curb* is the cause of it. It must be remembered that similar diseases do sometimes exist in both hocks at the same time, in which case it may be necessary for us to be familiar with the anatomy of the parts in a manner that can only be obtained by dissection or careful examination of the dissected parts, before we can distinguish between the natural formation and disease—for instance, we have *curby-hocked* horses, a style of conformation that may cause a doubt as to the existence of disease in the mind of those who have not given this subject a good deal of careful attention. This suggests the commendation of the growing tendency to have a veterinarian in the show ring to decide cases which properly come within the jurisdiction of such an expert. The

question as to why the hock joint is so often the seat of lameness or disease often claims our attention, but if we examine it from the anatomist's standpoint we will at once see that it is a very complicated joint, really made up of a number of little joints, and like other complicated things is quite liable to go wrong; but this is not all, for if we watch a horse in motion, fast or slow, backing or advancing, we will see that a more acute elbow is formed by this joint than at any other part of the leg, and in such a manner that it has to bear the strain of two levers, so much so that we might reasonably wonder why it is not oftener deranged; this perhaps may be explained by the fact that one of the levers at all events works upon the jack-screw plan (which may possibly have something to do with the origin of the term jack spavin), for evidence of this we have only to watch a horse drawing a load over a surface where the footing is a little slippery and we will observe that the hind foot turns around in a somewhat circular manner as if boring into the ground. As far as I am able to conceive from my knowledge of the anatomy of the hind leg this circular motion can only be produced, without increased expense to muscular force, by the peculiar shape of the bones entering into the formation of the true hock joint, the action of which, as pointed out by Prof. Williams, of Edinburgh, is like a screw, and in our opinion there is little doubt but that this screw-like motion is continued down to the foot under certain circumstances. This screw like motion is again important during rapid movements in trotting, especially in the horse with much hock action, as it prevents him from striking the lower surface of the body during extreme flexion of the joint, the foot being wound in an outward direction as it ascends from the ground. The circular motion of the foot is sometimes called *dishing*, possibly because it occasionally gives one the impression that the ground is being scooped out or *dished* by it. Some horses exhibit the dishing movement much more perceptibly than others do, which indicates that the screw like motion in the hock joint of some horses is greater than it is in others; then, if we are to regard the screw form of leverage as being the most perfect because it is the strongest, why other things being equal, the horse that dishes most will be the best performer, it does not matter whether it be under saddle, in the road wagon or at the plow.

Many years ago a gentleman once said to me that in the part of the old country where he came from they often used the expression, "a good disher means a good jumper." Our experience with horses rather verifies the truth of this expression, not only that they are good jumpers but good performers in a general way.

The Shank (Plate I, 17) is the part below the hock and above the fetlock; it corresponds to the canon of the front leg, proportionately speaking it is a little longer, flatter and measures more in circumference, as will be seen by comparing the measurements of different horses (see table). In shape it should be flat and deep from before backwards, the skin lying close to the bone and tendon—hard, flat legs being the ones which are best able to stand the trying work of the day. Those round, soft legs we so often meet with frequently prove a source of continual annoyance on account of being affected with Grease or some other similar disease.

The parts below the shank are so much like the same parts in the front leg that they do not require any special description except to repeat that the foot is usually smaller and more contracted, with the sole more concave and the frog a little less developed.

Color. It has been said from time immemorial that "a good horse cannot be a bad color," but we beg to take exception to this ancient adage, for we believe that a bad color often spoils a good horse from an artistic standpoint at all events, which at once becomes quite a point for consideration when we place an animal in the market for sale, though we do not intend to infer that we believe that the color affects the merits of the animal as far as performance is concerned, but rather that it is just as necessary to have a good color to complete the *tout ensemble* of a stylish carriage horse or a high class park saddle horse as it is to have a well formed head for instance.

It is often said that color has some significance in judging of the temperament of an animal, but our investigations in this line have not led us to believe that there is any reliance whatever to be placed in opinions formed upon such a theory. It is true that many chestnuts are high spirited, but the same may be said of any other color. Temperament is controlled, in our opinion, by something deeper seated than the skin, most likely the chief organ of the nervous system, the brain.

It is also contended that the color has much to do with the individual comfort of the animal when exposed to the influence of the sun's rays, more particularly in the summer season, but our observation has not demonstrated the truth of this supposition, for as far as our knowledge goes dark horses are able to do just as much work without showing fatigue on the farm or the road as lighter colored ones. This may perhaps be accounted for by the non-conducting properties of the coat, for the hair being a non-conductor, it probably makes little difference to the parts beneath what color it is as far as transmitting the influence of the sun's rays is concerned.

The power to resist heat or cold is, we believe, invested in the constitution of the animal.

It was generally conceded by those Greek and Roman equestrians who wrote before the christian era, that a good horse could not be judged by its color, although one of them goes so far as to say: "That a mane which is of the same color throughout and of fine hair is generally the best, and besides it is most unlike that of the ass and the mule." (See The Art of Horsemanship, by Xenophon, translated by Morgan, page 108.) I cannot help thinking that the writer regarded the *mane* in the same light that we do the *coat* or hair covering the whole body, in which case it is evident that like many persons of today, his taste ran to solid colors, but he does not give any preference to shade. The primitive colors of the hair of the horse appear to be *white, red, black* and *yellow*, all other shades or mixtures being simply modifications of one or more of them. If we infiltrate a few atoms of yellow into the white hair we get a cream, which is represented in the equine race by quite a variety of shades, according to the proportions of white and yellow.

If on the other hand we treat black and white in the same way, we get a dun color, which also has a variety of shades; while red and yellow, with some white, seem to produce the various shades of chestnut or sorrel, and bay as well as brown are no doubt produced by a delicate mixture of the four primitive colors. In some animals only one color is apparent, while in others it seems to take all four to produce the exact shade. The amount of coloring matter supplied to each individual hair is arranged by nature in many different ways so as to produce very different results. For instance, we find rings of certain shades surrounding spaces of other

shades, producing a dappled appearance, which is often admired, as the dappled grey, dappled bay or dappled brown, etc., etc., though we do occasionally meet with horses where the dapple does not improve the appearance. In other individuals we find the different colored hairs arranged so as to produce numerous shades of grey caused in a somewhat interesting manner by the predominance of one color or another; black and white producing iron grey; red and white, roan grey, or yellow and white, Isabella grey; the two latter with black hair produce roans of different shades, red roan or yellow roan, as the case may be. These, like all other shades, become light or dark according to circumstances.

We also meet with horses which are of two distinct colors, having sharp lines of demarkation between the one and the other. Indeed we have the different colored hairs arranged in so many different ways, that it does not seem necessary to attempt to describe them all here; while we occasionally have animals brought under our notice where the coat is of that peculiar tint that it becomes a matter of some difficulty to draw a line between one color and some other; browns are sometimes so dark that it is hard to say whether they are black or brown, and similar instances come before us in other shades, the cream and the bay, the chestnut and the cream and so on.

In selecting horses for the market color plays an important *role* in the make up of the animal, so the use the creature is intended for should be given due consideration. If we want an animal for park saddle work solid colors take well, while in most instances badly marked pie-balds would not be looked at, although for the circus ring they might be most coveted; again the dictates of fashion influence the demand and in some localities red roans will bring a higher price, all things being equal, than any other color. For farm work the darker colors generally look better and are less disagreeable in the warmer months of summer than white or other light colors. Extensive correspondence on the subject of color has demonstrated very clearly that much stronger prejudices exist amongst the patrons of the equine industry than is generally supposed, but happily the color does not, in our opinion, make any difference except for special purposes, this being the case we are all put at liberty to gratify our own tastes in selecting a particular hue.

Action and Gait embrace those movements performed by the extremities during progression, and may be considered under three primary heads —the walk, trot, and gallop—with their various modifications, the running walk, the amble or pace, and the canter. These we regard as natural gaits since horses possess them through some natural predisposition or instinct. The artifical gaits or ornamental movements are those which are taught in the high school of horsemanship, and perhaps may be regarded as belonging more to the circus ring or tan bark of the riding school, than the ordinary commercial horse-world. They consist principally of the *passage*, a species of trot in which the animal gathers itself into a rather showy attitude and progresses in a somewhat elastic manner, the *Spanish* walk, a most majestic movement in which the animal progresses in a remarkably precise manner especially as far as its front legs are concerned; the *Spanish* trot bears a very strong resemblance to the walk, the majestic precise movements being very perceptible. There are many other high school movements which it is not necessary to mention here.

Although we have divided the gaits into two groups, it must be remembered that a natural gait in one horse may be entirely artifical in another; indeed we can hardly take up a live stock paper without reading of some

converted trotter or pacer, as the case may be, while I have seen horses that did the Spanish walk or trot without an hour's training. Some horses cannot walk in the ordinary sense of the term, nor can others gallop, but so many are born possessing the first named gaits, that we feel justified in calling them natural, while the high school movements are obtained through training in nearly all instances.

In pursuing our investigations with regard to the gaits of the horse our chief aim has been to notice those movements which attract the attention of the rider or driver, and the more we inquire into this branch of our subject the more we are struck with the absolute necessity of selecting animals with the *correct way of going* if we desire to obtain the paying prices for our products when we offer them for sale. A gentleman from New York who has had a great deal of experience in the horse line in various capacities not only as an owner, but as a judge at the National horse show and other prominent exhibitions in the east, writes in reply to my inquiries that: "*A paragon of conformation and all the requisite virtues will bring $175–$300 here without action; one not half his equal in any particular, but with extra action will bring $700–$5,000. I have seen very poor individuals bring the latter price more than once.*" At the horse show of the Columbian Exposition I was much interested to observe the amount of stress exhibitors laid upon *action* in the draft classes as well as other breeds.

In pronouncing upon the action of a horse as being good or bad due consideration must again be given to the use the animal is intended for, because what might be looked upon as good action for one class of work, would appear rather indifferent for some other; take the saddle horse, and it is hard for the writer to conceive a more agreeable way of covering the ground than upon the back of a horse that has a nice long easy swing in the trot, going rather close to the ground, but with sufficient knee action to carry the toe well clear of all irregularities in the road bed, this with energy and moderate speed, goes a long way towards the make up of a good saddle horse; but the same style in a coach horse would hardly pass muster if intended for fashionable city driving; in addition to this (for saddle work) we must have the horse to canter nicely, with a long easy stride, free from that short bucking motion so often noticed in badly trained or inferior animals; the walk should be energetic, fast and smooth with plenty of elasticity to modify concussion. In some localities and with some persons the running walk is indispensable in the makeup of a first class saddle horse. The harness horse should be a good walker, a free, bold trotter with plenty of knee as well as hock action; the former must not only be high, but it must be far reaching so as to carry the foot through a telling space at every stride and do away with that short choppy action sometimes described by an old saying "that such and such a nag will trot all day in a bushel basket," while the latter must bend the joint thoroughly bringing the foot and curved pastern up from the ground in a sharp decisive manner, carrying them well forward and lowering them with energy and precision that reminds one of the movements of a clock, all jerky movements that indicate string halt being carefully avoided.

For slow draft work upon the farm, road, or in the city, the walking gait is even of more importance than any other, so much so that some agricultural societies award prizes for the best walker, an innovation to be highly commended.

Having disposed of the external conformation of the horse in a some-

what summary manner, let us turn for a moment to scales of points used in judging horses. In order to demonstrate the position we have taken with regard to them we reproduce our advance bulletin upon the subject, but wish to say in addition, that from information gained from numerous contributors we think the most satisfactory way to arrive at a scale of points which could eventually be looked upon in the light of authority would be through a National or International congress, made up of delegates from the different breeds and classes of horses, and let their decision as to what is required govern all *association show rings.*

The replies to the advance bulletin are to be counted by the hundreds, and, after reading them all carefully, the conclusion reached was that if it were possible to put them into a bag and shake them up thoroughly, the scales of points as we have arranged them would come out with so little change that one would hardly recognize it, although many writers took exception to the intrinsic value of all points on the body of a sound horse being equal (in this case a value of 5), some saying that the hock is of more importance than the head and consequently should have more points; but (leaving unsoundness out of the question), does not the head as often spoil a good horse as the hocks? Another says it is hardly fair to allow as much for the croup and dock as it is for the chest, but are there not as many horses injured from illy formed croups and crooked docks as from badly formed chests? And similar questions may be asked throughout the entire list.

It has also been suggested that one score card be arranged that will include all breeds and classes, the strong points of the different kinds of animals being emphasised in such a manner that they are not liable to be overlooked.

These and other questions are the ones which we think can only be settled by a congress of representative horsemen. We do not presume to offer anything more than the suggestion here.

Some horsemen are strongly opposed to judging horses by scales of points, and while there may be many good reasons why men of extensive experience in such matters should be permitted to form their own opinions after the fashion of time-honored custom, yet there are cases where, even to the most experienced, a standard of excellence would prove itself a very great convenience. The writer can call to mind a case of judging horses at an agricultural fair in a rural district, and in the draft class the horses were finally brought in line for inspection, but much to our dismay there was not what we would regard a draft horse in the lot, they were all under size and too light, but the first prize was, with much reluctance, eventually awarded to a handsome little pair of stout cobs, just such a pair as would look well before an ordinary express wagon, where moderately fast work was required, but entirely out of place in the draft truck, where the speed is seldom beyond the walking gate; certainly they might have been thrown out altogether, but there was no authority for such a procedure, nor did previous custom in that locality warrant it. On another occasion a line of saddle horses was presented; amongst them was a grand colt, with proper action and all the necessary requisites for a saddle horse, in fact as far as conformation and style went he was the only true type of a saddle horse in the lot, but he had one wall eye, a rat tail, and was of a most objectionable color, being pie bald on the hind quarters, mostly bay on the barrel and sides of the chest, and an indefinite roan on the neck and shoulders. He did not get the first prize! although there were those there who thought

he should have had it, and perhaps not without good reasons, but the variegated coat, the wall eye and the rat tail were so far from our ideas of a good saddle horse in the ordinary acceptation of the term that the prize went to another animal far inferior in point of merit. The propriety of these and similar decisions must remain open questions until the more salient features or essential factors in the makeup of a certain class of horse is defined by a recognized standard or scale of points. When this is produced the student can then form an intelligent opinion, within certain limits, as to what may be accepted or rejected in any named class, while those of more extended experience will have authority for supporting their opinions in cases were lines have to be drawn between one class and another, and breeders will be encouraged to breed more to type than they are at the present time.

We think that in judging horses by scales of points each and every point should be valued according to its merits as compared with the same point in other animals which are in the ring and before the committee for award, and not by its supposed importance or relative value as compared with other points in the same animal in a standard which allows say 100 or 1,000 as the maximum of the aggregate of all the points. By the former method the judgment at once evolves into the question of *good, better, best*, at each point, easier, however, to express by figures, and it insures thorough inspection of all the parts before they can be pronounced upon intelligently, a procedure in itself to be highly commended.

ADVANCE BULLETIN.

For some time past the Veterinary department has been making varied researches upon the different styles of conformation of the horse, with the hope of offering some practical suggestions to those who are engaged in, or about to engage in the equine industry, either as breeders, dealers or occasional owners, as well as to those who are from time to time placed in the responsible position of judges of horses at fairs and horse shows.

The further we go with the investigation, the more we are struck with the close attention that is given to the external conformation of other animals (dogs, cattle, sheep and swine) by the compilers of herd books and others, while the conformation of the horse is largely left to the hap-hazard fancy of the observer; in view of this it has been thought advisable to incorporate a scale of points (in a future bulletin upon the subject) for the different classes of horses which are on the market for sale, or in the show-ring for exhibition. Any scales of points that have been brought under our notice have hardly covered as much ground as we think necessary, and while we feel that those we have drawn up are far from perfect, yet they furnish more food for thought than any we have seen.

In order that the admirers of the individual classes may express their views upon certain points of excellence, this advance bulletin is projected with scales of points arranged in accordance with the ideas of the writer, at the same time with the request that those who are interested in the production of better horses, or in aiding beginners in the work of selection, will make such alterations or additions as to them may seem proper, and by so doing they will assist in the formation of a scale of points which, coming from many who are intimately concerned, may be looked upon in the future as authority.

In preparing these scales the terms haunch or *upper thigh*, and gaskin or *lower thigh* have been introduced because authorities in anatomy differ so much as to the situation and limits of the haunch and thigh. It is to be hoped the plan we have adopted will make description less confusing.

In drawing up the scale, more might be said with regard to size and shape of different joints, but as proper action demands properly formed joints, it was thought if they were not right, the discount for their ill-shape would be made when the individual's style and action were up for discussion, and thus the scale card will be less encumbered with words.

It is the intention to have our next bulletin illustrated in a manner that the various points of excellence, as well as other features, may be the more easily understood and a more or less detailed description of individual parts, with measurements of some well known horses, showing the diameters, length and breadth of them.

In these days of electricity and other motors for rapid transit, etc., the horse breeding industry is threatened with annihilation in some of its branches unless better animals can be produced. We must have stronger draft horses, more agile saddle horses, and faster roadsters to save our distance, in the struggle for existence.

Breeders as well as equine educators must be up and doing, and with the exercise of proper intelligence it is to be hoped *the horse* can hold his own against all competitors; therefore "no stone should be left unturned," that is likely to aid in the improvement of this animal.

CONFORMATION SCALE OF POINTS FOR THE COACH HORSE—STALLION.

HEAD—*Ear* fine, not too large, *forehead* broad and flat, *bones of nose* straight and dished on lateral surface, *cheek* muscle well developed, *eye* prominent, *nostrils* flexible, *mouth* not too deep	5
NECK—*Crest* well developed, neck itself being lengthy and properly muscled to carry head well	5
WITHERS—Well developed, *back* straight, loins broad	5
CROUP—Only moderately sloping, *dock* coming out high up, the *tail* well carried	5
CHEST—Well ribbed up, deep from above downwards, full in the bosom, *ribs* well sprung	5
SHOULDER—Moderately sloping, fully muscled	5
FOREARM—*Muscles* well developed and standing boldly out	5
KNEE—Broad from side to side in front, deep from before backwards; should be critically examined for malformations	5
KNEE TO FOOT—*Canon* clean, broad from before backwards, with *skin* lying close to bone and tendon, *pasterns* moderately oblique and strong	5
FOOT—*Wall* moderately deep and strong, *heels* full and round, *frog* well developed, *sole* concave	5
HAUNCH OR UPPER THIGH—Muscles standing boldly out and well defined, hind quarters broad	5
GASKIN OR LOWER THIGH—Well developed with muscles standing boldly out	5
HOCK—Broad from before backwards, thick and strong from side to side	5
HOCK TO FOOT—*Hind canons* clean, broader from before backwards, and flatter than the front ones, skin lying close to bones, *pasterns* oblique, but strong	5
FOOT—Smaller, with sole more concave than in front	5
COLOR—Bay, chestnut, black, brown, roan, with reasonable modifications (a good horse may be a bad color)	5
SKIN—Soft, mellow, loose, not like parchment	5
TEMPERAMENT—Docile not sluggish, but energetic, free from nervousness	5
STYLE AND ACTION—Free and elastic, knee well bent, front feet lifted well off the ground when in motion, *general appearance* attractive	5
WEIGHT—Pounds 1,100 to 1,400	5
HEIGHT—Hands 16 to 17	5

CONFORMATION SCALE OF POINTS FOR THE COACH MARE OR GELDING.

HEAD—Not so masculine looking as the stallion's, but of the same general outline	5
NECK—Clean cut, having crest well developed and wiry, *wind pipe* standing in relief from the muscles, showing the jugular gutter well defined	5
WITHERS—More prominent than in the stallion, *back* straight, loins broad	5
CROUP—Slightly sloping, *dock* coming out well up, the tail well carried	5
CHEST—Well ribbed up, deep from above downwards, *ribs* well sprung	5
SHOULDER—Moderately sloping, thoroughly muscled over the blade bone	5
FOREARM—Muscles well developed and standing boldly out	5
KNEE—Broad from side to side in front, deep from before backwards; should be critically examined for malformations	5
KNEE TO FOOT—*Canon* clean, broad from before backwards, *skin* lying close to bone and tendon, *pasterns* moderately oblique and strong	5
FOOT—Moderately deep and strong, *heels* full and round, *frog* well developed, sole concave	5

HAUNCH OR UPPER THIGH—Muscles standing boldly out and well defined, hind quarters broad 5
GASKIN OR LOWER THIGH—Well developed with muscles standing boldly out 5
HOCK—Broad from before backwards, thick and strong from side to side 5
HOCK TO FOOT—*Hind canons* clean, broader from before backwards, and flatter than the front ones, skin lying close to bone and tendon, pasterns oblique, but strong 5
FOOT—Smaller with sole more concave than the front ones 5
COLOR—Bay, chestnut, black, brown, roan with reasonable modifications (a good horse may be a bad color) 5
SKIN—Soft, mellow, not like parchment 5
TEMPERAMENT—Docile, not sluggish, but energetic, free from nervousness 5
STYLE AND ACTION—Free and elastic, knees well bent, and feet lifted well off the ground when in motion, *general appearance* attractive 5
WEIGHT—Pounds 1,050 to 1,300 5
HEIGHT—Hands 15¼ to 17 5

CONFORMATION SCALE OF POINTS FOR THE DRAFT HORSE—STALLION.

HEAD—*ear* somewhat short, but pointed, *forehead* broad, *nasal bone* straight, eye prominent, *eye* prominent, *muzzle* small, muscle of cheek well developed, lips firm, mouth of medium size 5
NECK—Inclined to be short, deep where it joins the body, surmounted by a good full mane, well muscled 5
WITHERS—In line with posterior part of the upper border of the neck, *back* straight, not too long, loins broad 5
CROUP—Loaded with prominent muscles, *tail* well carried 5
CHEST—Well ribbed up, breast broad and full 5
SHOULDER—Moderately straight, muscles covering the blade thoroughly developed 5
FOREARM—Large and well muscled 5
KNEE—Of good size and strong 5
KNEE TO FOOT—*Canon* may be well feathered on its posterior border, especially in the region of the fetlock, the tendon hard and not cut away under the knee, *pasterns* short and strong, some breeds should be free from feather 5
FOOT—Not too flat, frog well developed, heels full and round 5
HAUNCH OR UPPER THIGH—Heavily muscled, thick through the ham, hind quarters broad 5
GASKIN OR LOWER THIGH—Muscle strong and bone substantial 5
HOCK—Large and strong, free from puffy tumors 5
HOCK TO FOOT—Hind canon broad and flat, may be well feathered, some breeds excepted, especially in the lower part, skin lying close to bone and tendon, pasterns short and strong 5
FOOT—Smaller than the front one and sole more concave 5
COLOR—Bay, chestnut, black, brown, roan, gray, with reasonable modifications (a good horse may be a bad color) 5
SKIN—Soft, mellow, loose, not like parchment 5
TEMPERAMENT—Energetic, docile, not nervous 5
STYLE AND ACTION—General appearance attractive, good especially in the walking gait 5
WEIGHT—1,600 lbs. and upwards 5
HEIGHT—16 hands and upwards 5

CONFORMATION SCALE OF POINTS FOR THE DRAFT MARE OR GELDING.

HEAD—Not so masculine looking as the stallion, *ear* rather short but pointed, *forehead* broad, *nasal bones* straight, *eye* prominent, *cheek* well developed, *lips* firm, mouth of medium size 5
NECK—Inclined to be short, deep where it joins the body, well muscled, good mane 5
WITHERS—In line with the superior border of the neck, back short and straight, loins broad 5
CROUP—Well covered with prominent muscles, tail well carried 5
CHEST—Well ribbed up, barrel round and body close to the ground, *breast* broad and full 5

SHOULDER—Moderately straight, muscles covering the blade well developed 5
FOREARM—Large and well muscled 5
KNEE—Of good size and strong 5
KNEE TO FOOT—Not cut away too much under the knee; *canon* short, flat, may be well feathered, some breeds excepted, pasterns short and strong 5
FOOT—Not flat, *heels* full and round, *frog* well developed and springy 5
HAUNCH OR UPPER THIGH—Thoroughly muscled, thick through the ham, hind quarters broad 5
GASKIN OR LOWER THIGH—Muscles strong and bone substantial 5
HOCK—Large and strong, deep from before backwards, and broad from side to side, free from disease 5
HOCK TO FOOT—Hind cannon broad and flat, well feathered, except in some breeds, skin lying close to bone and tendons, *pasterns* short and strong 5
FOOT—Smaller than the front one, sole more concave 5
COLOR—Bay, chestnut, black, roan, brown, gray, with limited modifications (a good horse may be a bad color) 5
SKIN—Soft, mellow, loose, not like parchment 5
TEMPERAMENT—Docile, energetic but not nervous 5
ACTION AND STYLE—Good, especially in the walking gait, general appearance attractive 5
WEIGHT—Pounds 1,500 and upwards 5
HEIGHT—Hands 15¾ and upwards 5

CONFORMATION SCALE OF POINTS FOR THE THOROUGHBRED STALLION.

HEAD—Ears fine, not too large, approaching each other at the tips when thrown forward, *cranium* nicely rounded, *forehead* flat and broad, *eye* prominent and bold in expression, bones of the nose straight, but slightly dished on the sides, *nostrils* firm, but flexible, of large capacity when the animal is excited, lips firm, mouth not very deep, *muzzle* tapering and small, *cheek* clothed with well developed muscles towards its upper or back part, *branches of lower jaw* well spread apart behind 5
NECK—Clean cut and rangy, crest well developed and whip-cordy if animal is not fat, *jugular gutter* well marked, head attached to neck in an angular manner, rather of the obtuse order 5
WITHERS—Well developed, back straight, loins broad 5
CROUP—Rather long and somewhat sloping, but with dock coming out well up, tail carried in an arched and graceful manner 5
CHEST—Somewhat cone shaped with good, broad base behind, apex between the fore legs, where the animal may be excusably narrower in proportion than other breeds, the cavity should be deep from above downwards, especially at the girth, well ribbed up, the ribs having plenty of spring or well defined angles 5
SHOULDER—Oblique from above downwards and forwards, the blade bone being well clothed with muscle 5
FOREARM—Well developed, with hard muscles standing boldly out, and having to some extent grooves or lines of demarkation between them 5
KNEE—Broad from side to side and deep from before backwards, the bone forming the back part of it may be somewhat prominent, should be carefully examined for malformations and injuries 5
KNEE TO FOOT—*Canons* hard, flat and clean, little, if any, hair on posterior border (that is coarse hair), *fetlocks* free from disease, back tendons hard and whip-cordy, having well marked grooves between them and the bone, space between knee and fetlock short, *pasterns* somewhat lengthy, strong and oblique 5
FOOT—Rather smaller in proportion than other breeds, round, deep, strong wall, full heels and well developed frog, sole concave 5
HAUNCH OR UPPER THIGH—Formed of well developed, hard muscles, showing marks of demarkation between them 5
GASKIN OR LOWER THIGH—Hard muscles standing boldly out, ham string well defined and cordy 6
HOCK—Deep and strong, free from puffy tumors, of the angular order but not curby 5
HOCK TO FOOT—*Hind canon* short, flat, clean, rather oblique from above downwards and forwards, skin lying close to tendon and bone, *fetlocks* of good size and healthy, *pasterns* oblique, but strong and lengthy 5
FOOT—Smaller, not so round as front one, sole more concave 5

COLOR—Bay, chestnut, brown, grey, with reasonable modifications (a good horse may be a bad color) 5
SKIN—Soft, mellow, loose, not like parchment, hair forming coat, fine, silky, straight, hair of mane and tail, although coarser, should be soft, straight and fine in comparison with other breeds 5
TEMPERAMENT—Not vicious, but energetic, inclined to be impetuous 5
ACTION AND STYLE—Prompt, free and elastic, not too much knee action, but going rather close to the ground, especially in the gallop, good walker 5
WEIGHT—Say pounds 1,050 to 1,200 5
HEIGHT—Say hands 15½ to 16½ 5

CONFORMATION SCALE OF POINTS FOR THE THOROUGHBRED MARE OR GELDING.

HEAD—Rather small, ear fine and pointed, not too long, *cranium* nicely rounded, *forehead* flat and broad, eye good size and gentle in expression, *nasal bones* straight, but slightly dished on the sides, nostrils firm, but flexible, of large capacity, *lips* firm, *mouth* not too deep, *muzzle* tapering and small, cheek clothed with well developed muscles, *branches* of lower jaw well spread apart behind 5
NECK—Clean cut and rangy, crest well developed and cordy, the point where neck leaves off to be well marked and in front of the withers, *jugular gutter* plain, wind pipe standing out independently of the rest of the neck, attachment of head to neck well marked and to be rather angular, of the obtuse order 5
WITHERS—Well developed, forming a well marked prominence over the shoulder, the top of which should not be thick, the back, springing from posterior aspect of the withers, should be straight and short, loins broad 5
CROUP—Rather long and somewhat sloping, but with dock coming out well up, tail carried in an arched, graceful manner 5
CHEST—Somewhat cone shaped with good, broad base behind, apex rather narrow, but deep through the girth, well ribbed up, the ribs having plenty of spring or well defined angles 5
SHOULDER—Coming from high withers should be oblique from above downwards, blade bone well clothed with muscle 5
FOREARM—Well developed with hard muscles standing boldly out, and marked from one another by grooves 5
KNEE—Same as the stallion 5
KNEE TO FOOT—Same as the stallion 5
FOOT—Same as the stallion 5
HAUNCH OR UPPER THIGH—Same as the stallion 5
GASKIN OR LOWER THIGH—Same as the stallion 5
HOCK—Same as the stallion 5
FOOT—Same as the stallion 5
COLOR—Same as the stallion 5
SKIN—Same as the stallion 5
TEMPERAMENT—More docile than the stallion, but still energetic 5
ACTION AND STYLE—Rather lighter on foot than the stallion, in other respects about the same 5
WEIGHT—Say pounds 850 to 1,200 5
HEIGHT—Say hands 14¾ to 16½ 5

The saddle horse may be of the same general type as the thoroughbred, mare or gelding, good manners, a mouth that responds readily to the desires of the equestrian, graceful and elastic action in all paces being essential features in animals of this class. Good saddle horses are, to a large extent, made, not bred.

CONFORMATION SCALE OF POINTS FOR THE TROTTING BRED STALLION.

HEAD—Ear of medium size and pointed, *eye* large, prominent and of docile expression, *forehead* broad and flat, *nasal bones* straight and dished on their lateral surfaces, *cranium bones* nicely rounded, *nostrils* firm, large and readily dilated, cheek muscles well developed, mouth not too small, muzzle fine and tapering, *branches* of lower jaws well spread apart at their angles 5
NECK—Rangy with well developed crest and attached to the head in an angular sort of way, rather of the obtuse order 5
WITHERS—May be continuous with the superior border of the neck, back straight, loins broad 5

CROUP—Somewhat sloping with dock coming out high up, tail carried in an arched and graceful manner 5
CHEST—Deep through the girth, breast broad and bosom well developed, well ribbed up and *ribs* well sprung 5
SHOULDER—Oblique from above downwards and forwards, blade bone well clothed with muscles 5
FOREARM—Well developed with large muscles standing boldly out 5
KNEE—Strong, broad from before backwards 5
KNEE TO FOOT—Not cut away under the knee, *canon* short, flat, hard and broad, not feathered, fetlock well formed and free from disease, pasterns moderately long and oblique, but strong 5
FOOT—Of medium size, wall strong and circular in outline, *heels* full and round, *frog* well developed 5
HAUNCH OR UPPER THIGH—Muscles well developed, quarters broad, ham thick 5
GASKIN OR LOWER THIGH—Muscles well developed, ham string prominent 5
HOCK—Deep from before backwards, broad from side to side, healthy 5
HOCK TO FOOT—*Hind Canon* short, broader and flatter than in front, little, if any coarse hair on posterior border, fetlock of good size and sound, pasterns oblique, strong and medium length 5
FOOT—Smaller, not so round, sole more concave than in front 5
COLOR—Bay, chestnut, black, brown, roan, grey, with reasonable modifications (a good horse may be a bad color) 5
SKIN—Soft, mellow, loose, not like parchment 5
TEMPERAMENT—Docile, prompt, energetic, not nervous 5
ACTION AND STYLE—Free and elastic, perfect in the trotting gait and good walker 5
WEIGHT—Pounds 950 to 1,200 5
HEIGHT—Hands 15½ to 16¾ 5

The mare and gelding of the trotting class may be of the same general type as the stallion, but not so masculine looking; the neck, withers and general physiognomy being the points which contribute most to the more effeminate appearance of these animals. The neck should be more delicate and cleaner cut, the withers more pronounced and not as thick through and through at the upper part; the physiognomy milder and more gentle and less impetuous.

EDUCATIONAL SCALE FOR HORSES SHOWN UNDER SADDLE OR IN HARNESS.

Prompt response to all aids imparted by the hand, the reins, the whip, the heel, the voice or whatever else may be used in directing the movements of the animal 10

HEALTH SCALE OF POINTS.

Soundness from a practical point of view, freedom from vicious habits, gibbing, cribbing, wind sucking, weaving, etc., etc. 10

HISTORICAL SCALE OF POINTS—FOR REGISTERED ANIMALS ONLY.

From Wallace's Monthly, August, 1887.

A. PEDIGREE—This is the most important single point in the whole scale (*scale in Wallace's Monthly*), and yet it is the one that has received the least attention. Consider well what the sire and dam have each inherited, what each has done as a performer, and what each has produced in the stud. Then consider the qualifications to two grandsires and the granddams in the same way. If the animal under judgment is running bred, consider the running qualities of his ancestors, but if trotting bred, look only to the trotting qualifications. The value of the pedigree is in the merit of the immediate crosses, viewed in the light of inheritance, performance and production 50

B. PERFORMANCE—Ability to perform well compensates for shortcomings in inheritance. Nothing but technical *records* can be accepted on this point. Any record is better than no record. Every animal intended to produce trotters should have his or her speed developed to some extent. The character and precision of the gate, with freedom from all artificial appliances, must enter into the value of this point 50

C. Character of Offspring—This point applies only to aged and tried sires and dams. The credits will be awarded according to the number and class of fast performers from a given animal, the age and opportunities of the competitors being considered 50

[*N. B.—Points B and C are alternative; exhibitors shall elect one or other, but not both; perfection in each is 50.*]

In educational work the question often arises as to the best method of teaching a student how to judge a horse, but in this matter as well as other practical operations there can be little doubt that the best way to learn how to do a thing *is to do it*, and on this plan the best way to learn to judge a horse is to judge them. To begin with, the student must first of all make himself familiar with the various points of the horse, then make measurements on a plan similar to the following card. After measuring say ten horses according to this method, one will no doubt notice that his power of observation has become much more acute, which may be still further sharpened by scaling animals according to the plan suggested in this bulletin, or some other more acceptable one.

Measurements made with the tape line must be accepted with some little reserve, because we are often measuring from one imaginary point to another, and in taking circumferences the attitude of the animal modifies the size to some extent. All measurements should be made with great care, in order to have them anything like accurate.

Points to be measured from and to are indicated by dotted lines and numbers—see plates Nos. 2 and 3. One or two points are so self-evident that they are not marked.

PROPORTIONS OF THE HORSE.

Name of the animal ..... Class ..... Color ..... Age ..... Sex .....

..... Owner ..... P. O. .....

			Weight.	
Plate 3,	Fig. 1,	1.1		—Height at the withers.
" 3,	" 1,	2.2		—Length from point of shoulder to quarter. From the lowest point of the chest to the ground.
" 3,	" 2,	3.3		—From the point of the elbow to the ground.
" 3,	" 1,	4.4		—From the point of the elbow to the trapezium. From the trapezium to the ground.
" 3,	" 1,	5		—Circumference of the arm.
" 3,	" 2,	6		—Circumference of the canon in the center.
" 3,	" 2,	7		—Circumference of the foot at coronet.
" 3,	" 1,	8		—From the highest point of the withers to crest of occiput.
" 2,	" 1,	2½,2½		—Width of forehead. Plate 3, Fig. 1-9, length of head.
" 3,	" 1,	10		—Circumference of muzzle at angle of mouth.
" 2,	" 1,	6.6		—Width of chest from outside of shoulder points.
" 3,	" 2,	11		—Length of back from highest point of the withers to a line between the points of the hips.
" 2,	" 2,	13.13		—Width across the hips.
" 3,	" 1,	12.12		—Height at the highest point of the croup.
" 3,	" 2,	13.13		—From the center of the dock to anterior point of patella.
" 3,	" 2,	14.14		—From point of hock to point of hip.
" 3,	" 1,	15.15		—From point of hock to ground.
" 3,	" 2,	16		—Circumference of thigh.
" 3,	" 2,	17		—Circumference of shank midway between hock and fetlock.
" 3,	" 2,	18.18		—Circumference of body at the girth.

E. A. A. GRANGE.

Consulting Veterinarian to the Michigan Experiment Station.

Numbe	
Class ..	
Age in	
Sex	
Weight	
Height	
Length	
From th	
From th	
From th	
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Length to a li	
Width a	
Height	
From th patell	
From p	
From p	
Circum	
Circum fetloc	
Circum	

TABLE OF MEASUREMENTS OF HORSES MADE AT THE COLUMBIAN EXPOSITION AND AT THE MICHIGAN STATE FAIR. UP TO AND INCLUDING NO 30 WERE MADE IN MICHIGAN, FROM 30 TO 50 WERE MADE AT CHICAGO—MEASUREMENTS ARE MADE IN INCHES.

S stands for stallion, M mare, G gelding, R Roadster, D draft horse, C coach horse, A all work or general purpose horse.

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	12	43	44	45	46	47	48	49	50
Class	R	R	R	R	R	R	R	R	R	R	R	D	D	D	D	D	D	D	D	D	C	C	C	C	A	A	A	A	A	A	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	C	C	C	C
Age in years	5	7	11	12	9	6	4	5	5	11	3	7	5	9	8	3	6	5	4	4	4	4	3	3	5	5	3	5	9	11	4	4	8	2	1	2	4	4	1	6	4	8	5	3	3	6	6	6	7	6
Sex	G	S	S	S	S	M	G	G	G	S	S	M	S	S	S	S	S	S	M	S	G	G	S	S	S	S	S	S	S	S	S	M	S	S	S	M	S	S	M	S	M	S	S	M	M	S	M	S	S	S
Weight, in pounds	1,100	1,050	1,135	1,050	1,388	1,000	1,100	1,035	1,080	1,190	1,120	1,860	1,600	1,920	1,800	1,760	1,590	1,700	1,565	1,595	1,232	1,282	1,175	1,225	1,380	1,360	1,420	1,420	1,400	1,440	2,100	1,860	1,960	1,700	1,200	2,000	2,250	1,950	1,500	2,200	1,030	1,900	1,850	1,900	1,810	2,050	1,250	1,375	1,300	1,350
Height at the withers	64	61¼	61½	60½	68	62	62½	61	61	63½	64½	65	67¼	68	63½	64½	63½	65½	64½	64	64	64	62	62½	62½	62½	65½	64½	63	63	68	65½	64	64	60¼	64½	67	63½	61	67½	64	66½	64	64½	64½	66½	64¾	66	64¾	63½
Length from point of shoulder to quarter	67	64	64	61	67	68½	62	62	63	63½	66	72	69	74	68	69	67	70	71	71	66½	67	66	62½	66	68	68	69½	69	67	64½	71	71	71	69	70	75	74	68	73	72	72	73	70	67½	75	68	67	68	68
From the lowest point of the chest to the ground	33⅝	33½	34	34	38½	36	34	34½	33	36	37	34	35	38	31	34	32	37	34½	33	33½	33	34	35	32½	35	35	34	32	34	34	32½	33	32	32	33	34½	30	31	32½	30½	33	33	33	34	33	33	33½	33½
From the point of the elbow to the ground	37	37	37	37	42	36	38	36	36	37	39½	38	38½	40	38	35½	37	39½	37½	39	37	38½	38	37	36	38	36½	39	35½	37½	38	37	37	36½	36	34	37½	36	31	36	36	37½	37½	37½	37	37	37½	38	36½	37¼
From the point of the elbow to the trapezium	18	17	17	18	20	17	18	17½	18	19	19	18	18	19½	17	18	16½	18½	18	18	17½	18	18	18	18	18	17	17½	17	18	16	16½	16	16	16	16	17	16	16	16	16	18½	18	18	17½	18	18	18½	18	17½
From the trapezium to the ground	19	19½	20	19	22	19	20	18½	18	19½	20¾	20	21	20½	24	21	20½	24	20	21	19	19	20	20½	19	20½	20	21	19	20	20	20½	20½	20½	20	18	21	20	15	20	20	19	19	19½	18¾	19	20	20	18	19½
Circumference of the arm	19	18½	19½	19½	22	19	19½	20	18	23	22¼	23	22½	26	24	25	25	24	22	22	21½	22	20½	22	21	23	22	25	24	23	25½	22	25	24	24	24	28	24½	26	28½	26	24	24	27½	23½	29½	23¾	28¾	23½	23
Circumference of the canon in the center	8	7½	8	7½	10	7½	6	7½	7½	8	6	11½	9	12	11	11	10	9¼	9	9	8	8	6½	8½	8	8½	9	9	8½	9	10½	10	11	9¾	10	10	11	9¾	9¾	12	10½	9	9	9¾	8½	10½	8	8½	8	9½
Circumference of the foot at coronet	15	14	15	13½	16	14	15	14	14	15½	15	19½	17	20	19½	16	18	17	17	18	15	15½	15	15½	15	17	16	17	16	16	21	19¼	19	17	17	19	19½	18½	18	20½	19	19	19	19	15	18	14½	16	14¾	15½
From the highest point of the withers to crest of occiput	36	33	32	34	38	35	36¼	33	33	35½	35	36	38	45	38	36	34	36	35	36	33	34	35	35	38	36	37	34½	35	36	39½	36¼	38½	36	33	41	44	35	33	41	36	39	39½	38½	39	39	38½	40½	39	38
Width of forehead	9	9	9	8¾	9½	9	9½	9⅛	9	10	9½	10½	10	10½	9¾	9¾	9¾	10	9¾	10½	9⅛	9¼	9	9½	9½	9½	9	9¾	9½	9½	10½	10⅝	10½	9½	10	10	10½	9½	10	10¾	10	10	10½	10½	10	11½	9¼	9¾	9¼	10
Length of head	25	24½	24	23	26½	24½	25	24	25	26	26	28½	25½	28½	23	27	26	27	26	26½	25	24½	24	25¼	24½	25½	25½	26	25½	25	30½	31	30	29	29	28	29	27	28	29	27½	23	28	29	27	26	26	27	26	25½
Circumference of muzzle at angle of mouth	20	18	19	19	22	18	18	18	18½	20¼	21	23	21	26	22	22½	23	23	23	24	16	19	19	19½	23	23	22	21½	24	21	22¾	22	22	20	21	22	23	22	21	23	22	22	21	22	21	21	19½	21	19½	19½
Width of chest from outside of shoulder points	17½	17	16½	18	19	15⅛	16½	15⅝	16	16	18¼	21	19½	22	21½	21	20½	19½	19⅜	22	18⅛	17½	16¼	16	18	18½	19	19½	19	20	24	21	21	24	21	21	23½	23	19½	25½	24	19¼	18	19½	17	25	16½	19	18	19
Length of back from highest point of the withers to the line between the points of the hips	32	29	28	29	34	30	28	29½	29	30½	30½	34	28	35	29	30	30	30½	33	32½	31	30½	30	29	34	29	30	31	31	32	33	33½	32	30	33	36	31	36	33	32½	35	35	36	31½	33½	30½	34	29	32	32
Width across the hips	22	21	20½	20½	22	21½	22	22	21½	24	24	27	23½	24½	25	24½	25	25	24½	25	23	22½	22½	22½	22	22	23	23	23	23	26	29	29½	24½	24	30½	25¾	30	25	29	27½	26	28½	26	25	26¾	22½	22	24	22½
Height at the highest point of the croup	63½	60	60½	60	68	62	62½	60½	61	64¾	64½	65	65¾	68	68	66½	64	65¾	65	68½	68	63	62	62	62	63¼	64	65½	60½	62½	63⅝	65½	64½	65	61	64½	67	64	62	66	63	65½	65	65	64	66¼	64½	65	63¾	63
From the center of the dock to anterior point of pelvis	29	28	33	28	31	28	31½	29	30	31½	31½	36	33	34½	32½	32	33½	33½	34	32	31	31	31	31	30	32	31	31½	32	32	34	33	35	33	29	34	31½	36	33	36	33	30½	33½	34	31	31½	31	32	31½
From point of hock to point of hip	37	37	38	37½	41	38	39	38	37	39½	41½	37	39	42	40	39	39	41	41	39	37	37	38½	39	38½	39	38	36	36	38½	40	40	40½	40½	35	40	41	38	40	41	39	41	42½	41	40	39	40	40	39½	40
From point of hock to ground	24¼	24½	25	24	27½	22½	24	24	23	24½	25½	22	27	26½	25½	26½	25	26	25	24½	24	26	24	24	24	24	27	25	23	25	26½	24	25	26	24	24	26	24	24	26	23½	24	24	25	25	26	25	25½	25	25½
Circumference of lower thigh	17½	17	17⅛	16½	19	16	17	16½	16	18	17	20	20	21	22	21⅜	20	20	20	19½	17½	17	18½	18	16	19	19	18	19½	19½	23	20	24	20	20½	22½	22	21	21½	22	24	20¾	19	24	18¼	23	18	18	19	19
Circumference of shank midway between hock and fetlock	9	8½	9	8½	9½	8½	9	8½	6¾	9	9	12	10½	13	12	12	11	10¾	10½	10½	9	9	9¼	9½	9	10	10	10	9½	10	12½	10½	11¾	11	14	12½	12	11	11	13	12½	10¾	10½	11	9½	12	9	9¼	9	9
Circumference of body at the girth	71	67	69	67½	74	68½	71	69½	70½	72	71	89	76	69	82	80	77	80½	80½	81	74	75	71	71	77	73	78	75	76	76	82½	89	88	62	65	91	92	92	79	90	88	64	79	65	76½	89	74½	76	76	74

BULLETIN 111. JUNE, 1894.

MICHIGAN

STATE AGRICULTURAL COLLEGE

EXPERIMENT STATION.

HORTICULTURAL DEPARTMENT.

THE CULTIVATED RASPBERRIES OF THE UNITED STATES.

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AGRICULTURAL COLLEGE, MICH.
1894.

The Bulletins of this Station are sent free to all newspapers in the State, and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.

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THE CULTIVATED RASPBERRIES OF THE UNITED STATES.

BY A. A. CROZIER.

INTRODUCTION.

Our cultivated raspberries are derived, with a few unimportant exceptions, from three sources: the wild red raspberry of Europe, our own wild red raspberry, and our native black cap. The first was known and apparently cultivated by the ancient Greeks, who traced its origin to Mount Ida where it flourished wild, and from which it received its name, *Rubus Idæus*. Paladius, a Roman agricultural writer of the fourth century, mentions the raspberry as one of the cultivated fruits of his time. From the gardens of southern Europe it found its way into France, the low countries, and England, and from these sources into the United States. To this species belong the Red and White Antwerps, which have remained standards of excellence for upward of a century, the Hudson River Antwerp, Franconia, and other similar varieties. These foreign sorts, though often abundant bearers of large, finely flavored fruit, have in all cases proved adapted to but limited areas in the United States, owing to a lack of hardiness and to a liability to be injured by our hot summer suns. These defects finally directed attention to our native raspberries. The black cap seems to have been the first of these to have been brought into cultivation, and from the time of the earliest settlements we hear of the wild bushes being occasionally removed to the gardens. This species, *Rubus occidentalis*, is indigenous to the eastern United States, extending westward nearly to the Rocky mountains, northward into the margins of Canada, and southward to Texas and Alabama. On the Pacific coast and in the Rocky mountains is found another species closely resembling it, *Rubus leucodermis*, which in its native state appears quite as promising, but which has yet furnished no variety adapted to general cultivation. Both these species were largely used for food by the Indians and early settlers. The western species attains its greatest development in Oregon, Washington, Idaho, Montana, and the adjacent portion of British Columbia, extending southward in favorable situations in the mountains as far as New Mexico and Arizona. The eastern species, with which we are now more especially interested, attains its greatest abundance and development in the fertile wooded valleys of Ohio and Indiana, and from this region more of our cultivated varieties have come than from any other source. The species

extends, however, in almost equal perfection southwestward into Missouri and Arkansas and eastward into New England. The east has furnished the most early varieties and the west the most large and late ones.

As above stated, this species was for a long time cultivated in a small way with no attempt at improvement, and apparently without any superior natural varieties being recognized. In fact for a time prior to 1850 the ordinary wild form had come to be cultivated quite largely for market by some of the gardeners near New York City. The first distinct variety of this species of which we have record is the Ohio Everbearing, which attracted attention as early as 1832 from its habit of fruiting to a greater or less extent upon the young canes in autumn. For a family garden this was considered to be a desirable feature, though no varieties of this class ever found favor for market purposes. The yellow form of the black cap, represented by Golden Cap and other varieties, was introduced about the same time. The Doolittle next came into notice, about 1850, and attained prominence, not so much on account of its decided superiority to the wild species, as from the persistent advocacy of its merits on the part of the introducer, who claimed to have improved it and sustained it in vigor solely by means of propagation from young plants. It was a good variety, however, hardy and productive, and is still in cultivation. The sharp discussion which took place at the time of the introduction of this variety may be said to have decided the fate of the black raspberry as a cultivated fruit. Its merits were not so promptly and universally endorsed, however, as might be supposed from the position the fruit has since attained in our markets. In 1862 the editor of the *American Agriculturist* wrote: "all the finer varieties [of raspberries] are of foreign origin or seedlings of such sorts. After years of trial we have abandoned both the native red and black." A few years after this Charles Downing said that he dared not consider the black cap species worthy of cultivation. In 1870 Dr. J. A. Warder said of the black caps: "more discriminating tastes consider these essentially market fruits and unfit for the table of the refined pomologist." The esteem in which this species is now held varies considerably with different persons and in different localities. Black caps generally bring a lower price in market than the red varieties,—not only because they are more easily grown and more abundantly offered, but also because of their less attractive color and to many persons inferior flavor. In certain markets, however, the black caps are preferred. In Indianapolis, for example, which is abundantly supplied with black raspberries of fine quality, the demand for these is greater and more lasting than for the red varieties. In Boston, on the other hand, the demand is almost wholly for the reds and black caps can hardly be sold at any price. Black raspberries are extensively cultivated for drying, for which purpose they are well adapted.

Our native red raspberry has a wider range than the black cap, extending especially much farther northward. The boundary between the United States and Canada may be roughly taken as indicating its latitude of greatest natural development. This species, however, does not take so kindly to cultivation, and the origin of our varieties belonging to it is often obscure; we have but few well authenticated examples of the species in its purity having been brought from the wild state into cultivation and most of these soon disappeared. The evidence by which certain of our well known red varieties are assigned by botanists (doubtless correctly), to the native species, is mainly structural and not historical, since nearly all

have originated, directly or by descent, as chance or artificial seedlings upon cultivated ground. That our native red raspberry has played a large and perhaps controlling part in the production of our most popular hardy red raspberries need not be denied, but the doubt which we are obliged to recognize on this point rests on circumstantial evidence too strong to be entirely overlooked. We have a detailed account, for example, by Professor Turner himself, that the Turner, our most hardy red variety, whose claim to be a strictly native sort has gone unquestioned, originated in the midst of numerous other seedlings, which were grown from seed of the Red Antwerp. The Thwack, another hardy and popular sort, is said to be a cross between the Herstine and Brandywine and therefore probably contains some foreign blood. The Cuthbert, at present our most popular cultivated variety, which is usually regarded as of the native species, originated near New York City in a plot of an English variety known in this country as the Hudson River Antwerp. It seems possible therefore that American seedlings of European sorts, and hybridization from the same foreign source, may have played a more important part in the development of our cultivated red raspberries than has been generally supposed, and that the characteristic features of the foreign species, lack of hardiness, small light colored canes, numerous prickles, and thick rugose leaves, may become so far modified by cultivation and crossing that one cannot always be certain from inspection alone to which species, in whole or in part, a variety belongs.

As regards hybridization, while it is true that none of our most popular varieties are known to be of hybrid origin it must be remembered that the number of varieties so produced has as yet been comparatively few, so that the results attained in this direction by Brinckle, Arnold, Caywood, and more recently by Burbank and others, are still of much promise.

There is another group of probable hybrids, however, of natural origin between the native red and the black species, which has played a conspicuous part from the beginning of our raspberry history. This group is known, from the name of its first cultivated variety, as the purple cane group or family. Plants of this class are occasionally found growing wild where red raspberries and black caps occur. The botanist, Peck, described it as a distinct species under the name *Rubus neglectus*, but later botanists consider it of hybrid origin, the reasons being its intermediate character, its location in the vicinity of the two species mentioned, and particularly the fact of its never occurring anywhere in any considerable numbers, as a true species would be likely to do. In appearance these plants are usually more vigorous, and often more productive than either the red raspberry or the black cap. The canes are upright, slightly arching, and not inaptly described as "majestic" in appearance. They are generally of a reddish purple color, have rather few and small spines, produce few suckers or none, and root at the tips of the canes when artificially layered under cultivation but are not known to do so naturally. The fruit is usually larger than that of either the black or the red species, purplish in color, with large grains and tart flavor. This is the typical and ordinary "purple cap" or hybrid. There are other forms, approaching more nearly the red species, and differing from it in having darker colored fruit, etc., of which the hybridity is more in doubt. Of these is the once popular Philadelphia, originally found growing wild in the suburbs of that city.

The old Purple Cane, known also by various other names, was cultivated nearly ninety years ago in the vicinity of New York, Philadelphia, and

other eastern cities, and was undoubtedly the first American variety brought into cultivation; and it remained for more than half a century the leading variety over the greater part of the country. At present we have another prominent raspberry of the same group, the Shaffer, besides a score of other more or less desirable sorts of the same general character. These varieties are considered of superior excellence for canning and drying, and were it not for their dull purplish color which renders them less attractive to the eye, it is probable that the greater share of the raspberries upon our markets would be of this class, since large size, combined with hardiness, vigor and productiveness, have been found in these varieties to a degree attained nowhere else, while their upright canes, with few or no suckers, render them easy to cultivate.

A word may be expected concerning the nomenclature adopted in this catalogue. The leading purpose in its compilation has been to serve as an historical record, and a ready means for the identification of our cultivated varieties. For this reason the names have usually been given in their full form. In fact the abbreviated nomenclature adopted by the American Pomological Society in its catalogue of approved varieties could not be followed with safety in this larger list. This will be apparent when it is recalled that, aside from synonyms, we have among our raspberries at least six "Smiths," five "Queens," and numerous other names which could not be reduced to a single term without ambiguity. This consideration, and the fact that the number of varieties is already large and rapidly increasing, emphasizes the importance, not only of caution in introducing new varieties but of applying to them simple and suitable names.

CATALOGUE.

[The enclosures in brackets following the names indicate the species to which each belongs, Black Cap meaning in all cases *Rubus occidentalis*, and Purple Cap the supposed hybrid between *occidentalis* and *strigosus*. In the red varieties the species when known is in each case written. An X between two species indicates that the variety named is a hybrid between them. The quotations used in this catalogue are frequently condensed. The original wording has been retained wherever practicable.]

ABEL. See FRANCONIA.

ACME. See PALMER.

ADA. [Black Cap.] A chance seedling originating on the grounds of Mr. Henry Young of Ada, Ohio, some ten or twelve years ago, and supposed by him to be a cross between Doolittle and Mammoth Cluster, since these were the only varieties grown by him at the time. Mr. Young sold the stock to Theo. F. Longenecker of Dayton, by whom it was introduced. F. R. Palmer of Mansfield, Ohio, who obtained it for trial before its general introduction, stated that he had discarded it, as with him it did not equal the Gregg. There is considerable complaint that it lacks vigor and productiveness. It is usually described as nearly as large as Gregg, more hardy, fully as productive and ripening a little later. The Pennsylvania experiment station said of it in 1893: The plant is strong, with a whitish green, thorny stalk and bristly hairs on the fruit stems, berry not large although the several drupes are large, making the berry rather soft; it is reddish-black in color and slightly acid in taste. One season is not enough to determine productiveness, but the berry itself has little to recommend this variety.

ADDISON. [Purple Cap.] "An apparent hybrid between the red and the black cap," originating on the grounds of L. M. Macomber of North Ferrisburg, Vt. It is not yet introduced but is said by the originator to be a desirable sort more hardy than the Cuthbert. S. A. Beach, of the Geneva, N. Y., experiment station, reports as follows: Fruit medium to large, firm, juicy and very good, with the flavor of the red raspberry. The canes are purplish red, much like some of the red varieties in color but in habit more like the black caps. Propagation is by tips. The canes are vigorous, hardy and moderately productive.

ALDEN. A name proposed for the OHIO by J. T. Lovett at a meeting of the American Pomological Society, in 1883, to better distinguish that

variety from the Ohio Everbearing. It was never adopted, however, by the society (as has been sometimes stated), and appears never to have been used, except by one or two nurserymen. Mr. Alden, whose name it was proposed to honor, was the well known inventor of a fruit evaporator.

ALLEN. [*Allen Antwerp, Allen's Red.*] Introduced in 1856 by Lewis F. Allen of Black Rock, near Buffalo, N. Y., after having been grown by him for fifteen years. Mr. Allen seems to have sent out two or three kinds under his name, but the one here described is much the best known. Plant vigorous, upright, suckers freely, stands both cold and sun comparatively well, and is therefore considered by many to be a variety of *strigosus*, which may be doubted. The blossoms appear to be deficient in pollen, rendering the crop uncertain unless planted near a perfect flowering variety. It was doubtless for this reason that in 1861 the American Pomological Society removed it from the approved to the rejected list. The bright red fruit is of fine appearance and flavor, large, firm, nearly globular, or somewhat flatter than the Kirtland. The Herstine and several other sorts have been derived from the Allen. (See remarks under ENGLISH RED CANE.)

ALLEN'S RED PROLIFIC. A variety never widely cultivated, of the same origin as the Allen and of much the same character, but an improvement upon it having perfect flowers.

ALL SUMMER. [Red.] Introduced in 1893 by John Lewis Childs, Floral Park, N. Y., who says in his catalogue: Purchased three years ago from Mrs. A. A. Stowe of Idaho, who had grown it for five years. She obtained it from California, though it came originally from Mexico. Stems three to five feet; leaves large and green, silvery below; fruit large, dark red, of fine quality, ripening from July until frost.

ALPINE. [Red, *Idæus.*] Wm. W. Valk, M. D., of Flushing, Long Island, N. Y., mentioned the "true Alpine" as a desirable sort to cross upon such varieties as the Red Antwerp, Franconia, etc. (*Horticulturist, 1847–8, p. 354*).

It was introduced by W. R. Prince from the Mediterranean a short time prior to 1832 (Pom. Man., pt. II, p. 169).

AMAZON. See BELLE DE FONTENOY.

AMERICAN BLACK CAP. [*Rubus occidentalis.*] The common native unimproved black raspberry of the eastern United States. It is often known, particularly in New England, as the Thimble-berry, though that name is also applied to the blackberry. From this species have been derived, with probably two exceptions, all the "black cap" raspberries in cultivation. The wild plants take readily to cultivation and are improved in quality and productiveness thereby. Prior to about 1850, when improved varieties began to be generally known, the ordinary wild form was considerably grown in gardens. It was cultivated in England as early as 1825. See Note 1.

AMERICAN EVERBEARING. An everbearing black cap, sent out in 1890 by the Cleveland Nursery Co., now of Rio Vista, Va. It is said to be valuable for its more than usually continuous bearing. Reports state that it is of good size, but only moderately productive, and neither firm nor of high quality, being quite sweet, while a heavy gray bloom detracts from its appearance. Mr. Hatfield, of Wayne county, Ind., who named the variety and brought it to notice, did not know its history, but

stated that it originated on a farm within a few miles of his place, where it was growing when he first saw it. At the New York experiment station at Geneva, in 1893, its season of ripening for the main crop was about medium, extending from July 8 to July 20, while the autumn crop continued from the last of August through September.

AMERICAN IMPROVED. See DOOLITTLE.

AMERICAN RED. The common and only native red raspberry (*Rubus strigosus*) of the United States and British North America. At first by botanists, and later by others, it was considered the same as the wild raspberry (*Rubus Idæus*) of Europe, which it closely resembles. Hence it is not surprising that the wild species and some of its varieties have at times been erroneously called Antwerps. The American species and its cultivated varieties are more hardy against both cold and heat than the European varieties, rather more vigorous, and generally ripen their fruit somewhat earlier in the season. A white fruited form is known in the wild state. See also COMMON RED.

Dr. J. A. Warder wrote in 1870: American Red (*Red Antwerp, Cincinnati Red Antwerp*) a native, long cultivated and improved, but retaining its piquant wild flavor; fairly hardy, rather productive, of mid season, fair size, roundish, bright red, soft and juicy and to most palates agreeable.

AMERICAN RED CANE. See PURPLE CANE.

AMERICAN WHITE CAP. A form of the common black cap, an isolated plant of which is occasionally found growing wild, with fruit usually of a pale yellow, but varying from white to a rich golden color. It is an albino black cap, and does not as a rule reproduce its color from seed. The stems as well as the fruit possess the characteristic yellowish color. The plant is also frequently, and quite appropriately, called "Yellow Cap." Many varieties of this form have been introduced into cultivation, such as Haskell's Yellow, Yellow Pearl, Golden Cap, and Golden Thornless. None of them however have ever become very popular and all are now discarded from most lists of approved varieties. The vigor of these varieties is usually nearly equal to that of the ordinary black cap, and most of them are sufficiently productive, but their flavor is generally considered inferior to that of the true black caps and their color soon changes when ripe to a dingy brownish yellow which injures their appearance for market. Birds trouble these varieties less than the black caps. There are varieties of this as well as the common black cap which bear fruit in late summer and autumn upon canes of the current year.

AMERICAN YELLOW. See AMERICAN WHITE CAP.

ARCTIC. [Black Cap.] Received at the N. Y. experiment station at Geneva from an unknown donor in 1892. The next year it ripened in the middle of summer; fruit medium to large, moderately firm, juicy and sweet.

ARNOLD. See ARNOLD'S RED.

ARNOLD'S HYBRID. Charles Arnold of Paris, Ontario, produced several hybrid varieties of the raspberry. The above name has sometimes been applied to Arnold's Red, the one which is the best known.

ARNOLD'S RED. [*Occidentalis* x *Idæus.*] (*Red Canada, Arnold's No. 1 Red.*) Probably the best, and certainly the best known, of the late Mr. Arnold's seedlings, but too much inclined to sucker and the fruit too soft for market, therefore never popular and now seldom planted. Canes

hardy, with dark purple spines, branching, vigorous, moderately productive. Fruit ripening in summer, rather late, and again more or less in autumn. Berries about the size and shape of Philadelphia, but perhaps of better flavor. For an account of its origin see remarks under DIADEM.

ARNOLD'S ORANGE. [*Occidentalis* x *Idœus.*] (*Orange King.*) Canes yellowish, almost smooth, with few suckers. Fruit large, of fine flavor, somewhat shorter than in Brinckle's Orange and of a darker orange color. Mr. Parry of New Jersey reported it in 1877 as hardy, vigorous, moderately productive, and of good quality. For its origin see remarks under DIADEM.

ARNOLD'S WHITE. See ARNOLD'S YELLOW.

ARNOLD'S YELLOW. [*Occidentalis* x *Idœus.*] (*No. 2 White, Arnold's White, Yellow Canada.*) Fruit nearly white, large and fine flavored, but not as large or good as Brinckle's Orange. Plant of a "peculiar albino" appearance, quite vigorous, productive and hardy, suckers freely, bears very early, and again sparingly in autumn. For an account of its origin see DIADEM.

AUGUST BLACK. [Black Cap.?] Produced by Thomas Rivers of England. Described by Charles Downing in 1869 as follows: Canes strong and branching, bearing quite numerous, greenish spines. Fruit of medium size, roundish oblate, dark red [?], with slight bloom, sub-acid, and rather soft. See Note 1.

AUTUMN BLACK. [Black Cap.] Produced by Thomas Rivers of England and said by him to propagate only from seed. (He was unaware of the tip-rooting habit of black caps.) Fruit described by him as medium to large, dark purple, juicy and agreeable. Catalogued by Downing, 1869. See Note 1.

AUTUMN BLACK CAP. Applied to any fall bearing black cap, and sometimes especially as a synonym for Lum's Everbearing, which see.

AUTUMN SURPRISE. See SURPRISE D'AUTOMNE.

BABBIT. [Black Cap.] Sent in 1892 by W. R. Laughlin of College Springs, Iowa, to the U. S. Department of Agriculture. Described in the report for that year as a strong, vigorous grower, very productive and hardy with a long season. Fruit medium in size, roundish oblate, drupes small and rather numerous, dull black, without bloom, moderately firm, juicy, sub-acid and good. Yield on plants of the same age 50 per cent more than Hopkins. Mr. Laughlin writes me as follows under date of February 27, 1894: "The Babbit originated as a chance seedling eleven years ago this spring on the nursery grounds of my adjoining neighbor, Mr. Babbit, who owns the entire stock. Today I carefully inspected his bushes and found them uninjured, though the cold at one time this winter reached —25°. The Hopkins, our standard berry heretofore, is injured, but not enough to affect the crop. Both received the same treatment. I shall plant the Babbit largely this spring. The plant is of the same habit as the Hopkins, but is one-third larger. The fruit is larger than the Hopkins, but smaller than the Gregg, almost without bloom, a shiny black with a tinge of wine color; in quality as good as any."

BABCOCK. [Purple Cap.] Sent in 1892 from Daniel W. Babcock, Dansville, N. Y., to the N. Y. experiment station at Geneva, from which it was reported the year following as productive and vigorous, with canes of

a peculiar purplish color, thickly beset with weak prickles. The fruit as far as tested crumbled badly.

BAGLEY'S PERPETUAL. [Red.] Originated about 1854 at New Haven, Ct., and introduced in 1858 by Andrew Bridgeman, a florist of N. Y. City. Said by some to be hardy, productive and fine flavored, canes stout and branching, about four feet high, destitute of prickles, fruiting on the young canes from the time the old canes cease bearing in July until frost. Fruit described by Charles Downing as of medium size, oblate, crimson, brisk sub-acid and of poor quality.

BAKER. [Red.] Wm. Parry of N. J. said in 1870: Sent out from Cincinnati. Has fruited with me and appears hardy and promising.

BALDWIN'S CHOICE. See TURNER.

BARNET. [Red, *Idæus.*] (*Barnet Cane, Cornwall's Prolific, Cornwall's Seedling, Cornwall's Red, Lord Exmouth*). An old English variety, early and very productive. Much like the Red Antwerp, but never popular in the United States on account of its soft fruit and tender canes. Described by W. R. Prince in 1832 as having long, yellowish green canes, more branching, especially toward the base, than the Red Antwerp and covered with numerous slender bristles which become stronger above and turn a dull brown in autumn. Fruiting branches nearly smooth, fruit large, soft, roundish, bright purplish red, of a rich agreeable flavor. It is said to have originated from seed by a Mr. Cornwall, at Barnet, Herefordshire, England.

BARTER. [Red.] Said by E. J. Wickson of California in 1891 to be a large sized, nearly round, vigorous and productive variety, first grown by Wm. Barter of Penryn, Placer county, to whom it was given as a "foundling" variety by a friend. He added that it was largely grown in the foot hill regions of that state.

BAUMFORTH. [Red, *Idæus.*] Recorded by Charles Downing in 1881 as a new seedling raised by John Baumforth of Pontrefract, England, from Northumberland Fillbasket and said to be earlier than that variety, more vigorous, with larger fruit composed of large crimson drupes.

BECKNER. A chance seedling found about 1855 by J. Beckner, Lafayette, Ind.

BEEBE. [Black Cap.] (*Beebe's Golden, Beebe's Golden Prolific.*) A "yellow cap" said to have been introduced from N. Y. in 1886. The plant lacks vigor, and the fruit is small, and when ripe quickly turns from a golden hue to a dingy brown.

BELLE. [Black Cap.] Sent to the *Rural New Yorker* in 1885 by L. C. Carlow of Batavia, Ill., and reported by the editor the following year as one of the most hardy, vigorous and productive black caps he had ever grown, among the earliest and as large as the Gregg, but in his trial singularly devoid of flavor.

BELLE De FONTENOY. [Red, *Idæus.*] (*Belle d' Orleans, Amazon.*) Introduced from Europe about 1850. A vigorous variety, hardy for its class, with numerous suckers which often fruit in autumn. Spines purplish, short, stiff and quite numerous. Foliage thick, and silvery upon the lower surface. Productive in some localities, but not in others. Fruit large, conical, deep red, firm, rich, juicy and aromatic, adhering slightly to the core. The Autumn berries are said to be more irregular in shape and inclined to crumble. The name "Amazon" is said to have been applied to

some plants of this variety found growing by the wayside at Edesville, Md. They were supposed at first to be a new variety and were so fine that they were distributed under this name. Fontenoy is a village of Belgium, where the French under Marshal Saxe gained a victory over the armies of the Dutch and English in the 18th century.

BELLE De PALLUAU. [Red, *Idœus.*] Described by Downing in 1869 as a promising new French variety with strong, vigorous, upright canes, bearing at the base numerous short, purplish, rather slender spines. Fruit very large, obtusely conical, light crimson, with large grains and few hairs, quite firm, rich and juicy, separating freely from the core. Season apparently early for one of its class.

BELMONT. [Black Cap.] Originated by John Scobs of Barnesville, Ohio, and introduced in 1879. Said to be larger and more productive than the McCormick and about six days later.

BLACK GIANT. See SMITH'S GIANT.

BONANZA. [Black Cap.] Originated on the grounds of W. C. Freeman, near Springfield, Mo., and introduced about 1888. Said to be a fine large variety with a long season.

BRACKETT No. 101. See LOTTA.

BRANDYWINE. [Red, *strigosus.*] (*Wilmington, Susqueco.*) Found wild near the Brandywine river or creek at Wilmington, Del., and first sent out through the country under the name "Susqueco," the Indian name of the stream. Admitted to the catalogue of the American Pomological Society in 1877, it gradually attained quite a prominent place among the market varieties. The canes are hardy, but sucker excessively and are somewhat lacking in vigor, requiring strong soil to be productive. Fruit firm, of good red color, somewhat roundish, flattened, medium in size, but usually considered rather dry and flavorless. Wm. Parry stated that he had never been able to trace the origin of the variety, but that it first attracted attention about 1870 and was for a time called Wilmington. Subsequently Mr. Edward Tatnall of Wilmington undertook to introduce it under the name Susqueco. It soon became the leading market variety along Brandywine creek and people generally insisted upon applying to it the name of that stream. A. S. Fuller says of the Wilmington: "Better in quality than Cuthbert, canes rather dwarf, but stocky and exceedingly productive, bark red with very few prickles—almost as smooth as that of the Turner."

BRENTFORD CANE. [Red, *Idœus.*] An English variety, introduced prior to 1832, little known in the United States, but said to be unproductive. Canes vigorous and branching, bearing purplish prickles; fruit of medium size, oval, conical, dull red, and of rather inferior quality.

BRENTFORD RED. [*Idœus.*] Dwarf, slender, bearing numerous small spines; fruit of good size and quality, with usually a second crop in August. (W. R. Prince, Pom. Man., 1832, pt. II, p. 169.)

BRINCKLE'S ORANGE. See ORANGE.

BRISTOL. [Red.] Reported as new by Wm. Parry of N. J. in 1876 and said by him to be vigorous and to sucker excessively, being much like the Brandywine, but not so firm. The editor of the *Rural Home* saw it on Mr. Purdy's place in 1876 and described it as having few feeble spines, bright red, firm, conical fruit, above medium size, sweet and pleasant, much

like Kirtland in flavor. It was rejected from the Michigan fruit catalogue in 1888.

BURLEY. See RED ANTWERP.

BURLINGTON. [Red.] (*Prosser.*) Charles Downing, in 1869, stated that it originated with Benjamin Prosser of Burlington, N. J., but that two or three kinds had been sent out under this name. The one he described is moderately vigorous and productive, the canes clothed with numerous, slender, greenish white spines, tinged with brown. Fruit large, scarlet, firm, juicy, sweet and good, composed of rather small, compact grains. In 1893 T. T. Lyon reported it as of large size and good quality, among the earliest to ripen but the lowest in yield.

BURNS. [Black Cap.] Reported to the American Pomological Society in 1875 by D. B. Wier as a seedling of the native black cap raised by A. M. Burns of Manhattan, Kansas, about 1866. The fruit was of fair size, and medium quality, and the plant distinguished for its ability to withstand both cold and drouth.

BUTLER. See CROMWELL.

CANADA. [Black Cap.] Of Canadian origin prior to 1869. Popular in a few localities, but rejected from the Michigan fruit list in 1888. Season medium.

CANADA RED. [*Strigosus.*] A form of the native red raspberry recorded by W. R. Prince, a nurseryman of Flushing, Long Island, in 1832. He said, "I first noticed this variety growing along the roadside a few miles from Montreal where it grows in great abundance and the fruit is collected by the country people and sold in the markets."

CANE STOCK. See PURPLE CANE.

CARDINAL. [Purple Cap.] (*Griesa.*) A late red berry, of medium size and long ripening season. Originated on the grounds of A. H. Griesa, Lawrence, Kansas. Mr. Griesa writes that it originated in 1888, apparently from a seed of the Shaffer, grows about four feet high, and for the first year or two propagates from tips, but as it grows older it throws up suckers, which are loaded with fine large berries from the ground up, a feature he had never seen in any other variety. The old canes, being inclined to anthracnose, do not fruit with him, but if these are cut down in winter or spring a full crop is obtained upon the new growth. The N. Y. experiment station at Geneva reported in 1893 the fruit as large, soft, juicy, not so dark colored as Shaffer and better flavored.

CARLETON. On trial at the experimental farm at Agassiz, B. C.

CARMAN. [Black Cap.] Originated by A. H. Sherwood, Southport, Ct., and named in 1885 in honor of E. S. Carman, editor of the *Rural New Yorker*. Introduced about 1886 by G. H. and J. H. Hale of So. Glastonbury, Ct. In season and growth they say it much resembles Souhegan, though it does not branch so freely and has fewer spines. Reports vary somewhat as to its season, but its want of popularity is undoubtedly due to the presence of Souhegan, Tyler, and other varieties, equally good or better, at about the same season.

CAROLINE. [Yellow.] Originated in 1877 by S. P. Carpenter of New Rochelle, N. Y., from seeds of Brinckle's Orange, crossed, it is believed, with the Yellow Cap, a variety of *occidentalis*. Catawissa is claimed by some to have been one of the parents, but there seems to be

not sufficient authority for the statement. The plant is strong, vigorous, productive, moderately hardy (hardier than Golden Queen, it is said), and propagates by both tips and suckers. Season medium, ripening with Marlboro. Requires good culture to properly ripen and develop its large amount of fruit. Admitted to the catalogue of the American Pomological Society in 1881, it soon became the most popular of the yellow varieties, an interesting fact, considering its hybrid character. With many, however, the Golden Queen, being firmer and somewhat larger, is now taking the preference, while Brinckle's Orange remains the choice of those who have the proper climate and who regard quality above everything else.

CARTER'S PROLIFIC. [Red, *Idæus.*] An English variety described by Downing in 1869 as having vigorous canes bearing purplish spines. Fruit large, obtusely conical, deep scarlet, with slight bloom; grains of medium size, compact, rather firm, sweet, moderately juicy and pleasant.

CATAWISSA. [Purple Cap.] Described by the introducer, Joshua Pierce of Washington, D. C., in the Agricultural Report of the U. S. patent office for 1854, as a new variety cultivated by him for the past two years which was originally discovered growing wild in the graveyard of the little Quaker meeting house in the village of Catawissa, Columbia county, Pennsylvania, near the confluence of the Catawissa and Susquehanna rivers. The strong branching canes, says Dr. Warder, seldom sucker and do not naturally root from the tip, though they can readily be made to do so, particularly in the case of young plants which have not yet fruited. The new canes bear more or less in autumn, and can be made to bear freely from August until frost by cutting away the old canes in the spring. It was formerly considered among the best of the fall bearing varieties, when such kinds were more popular than now. Season medium. Plants productive on good soil, but seldom hardy north of Pennsylvania. Fruit round or flattish, of medium size, dark reddish purple and of good quality. Dropped from the catalogue of the American Pomological Society in 1883, having declined in popularity to one star each for New York and Georgia.

CENTENNIAL. [Black Cap.] Originated by Mr. Grahill of Springfield, Mo., and apparently named and introduced by him in 1876. T. T. Lyon describes it as about like Doolittle, being of mid-season, glossy black, small size, medium quality and moderate vigor and productiveness. Samuel Miller of Bluffton, Mo., writes that he was among the first to get and fruit this variety and still considers it the best early black cap he has. He describes it as large, more conical than other black caps, with no bloom, sweet and high flavored, perfectly hardy in the latitude of St. Louis, Mo., not as productive as some, but sufficiently so, and as early as Souhegan.

CHAMPION. [Black Cap.] An early sort found growing wild in Clarke County, Ohio, and sent out for trial a few years ago by Frank Murphy of Donnelsville.

CHAMPLAIN. [White, *Idæus.*] Introduced by Ellwanger & Barry in 1892. J. T. Macomber of Adams, Grand Isle Co., Vt., writes: "This is a chance seedling, which came up in my father's garden some ten or fifteen years ago and is supposed to be a seedling of the White Antwerp, which it much resembles."

CHAPMAN. [Black Cap.] Grown by Mr. Chapman or found by him as a chance seedling near Cincinnati, Ohio, and carried to Chillicothe that state by Felix R. McLean in 1862 or 1863, and planted on a farm after-

wards owned by Mr. Bailey, from whom plants were sent in 1871 to Geo. W. Campbell of Delaware, O., who makes this report, and adds that he has since learned that it is the variety now known as the Ohio. A variety by the name of "Chapman" was on trial in 1887 at the Ohio and Minnesota experiment stations.

CHARLES THE BOLD. One of Arnold's hybrids to be sent out in 1877. (Rep. Com. Ag. and Arts, Ont., 1875, p. 316.)

CHILIAN. Probably the YELLOW CHILI, which see.

CHURCHMAN'S SUPERB. See SUPERB.

CINCINNATI RED. See KIRTLAND.

CLARKE. [Red.] Originated by E. E. Clarke of New Haven, Conn., about 1857. Canes strong, vigorous, usually productive, but generally considered tender, being less hardy it is said than the Kirtland, but similar to it. Charles Downing considered it more hardy against heat and cold than any other foreign variety, and the best of its class for light sandy soils. He described it as having large purplish spines, large, flat and thick foliage, fruit of a bright crimson, quite hairy but sweet and good. S. A. Beach of the N. Y. experiment station at Geneva reported in 1893 that it was one of the most productive varieties tested at that station, having tall, prickly canes, and medium to large fruit; juicy, moderately firm and very good in flavor, but turning dark when fully ripe. Its season is early, form nearly round. Some complain that its fruit is apt to become small and crumbly. It was never popular in the west.

CLINE. [Red.] A chance seedling said to be very early, sent out for trial in 1893 by G. W. Cline of Winona, Ont.

COLE'S PROLIFIC. Exhibited at the Chicago Exposition in 1893 by the Fruit Growers' Association of Ontario. It was found growing wild by a Mr. Cole of Port Dalhousie, Ont. Mr. L. Woolverton, secretary of the above association, says that it "may possibly be worthy of further testing."

COLONEL WILDER. [Yellow, *Idæus.*] A seedling raised by Dr. W. D. Brinckle of Philadelphia, and named by him in honor of Marshall P. Wilder, President of the American Pomological Society. It first fruited in 1847 and is described as having strong, branching canes eight feet high, bearing strong white spines; leaf large, roundish, much crimped, fruit soft in texture, about the size and shape of the Yellow Antwerp, but of a more distinctly yellow color. Never largely grown, as Brinckle's Orange proved to be better. Fig. *Horticulturist*, Sept., 1866.

COLOSSAL. [Purple Cap.] A seedling of the Shaffer much resembling its parent, sent by O. F. Street of West Middleton, Ind., to the U. S. Dept. of Agriculture in 1892.

COLUMBIAN. [Purple Cap.] A seedling of the Cuthbert grown near the Gregg, on the grounds of J. T. Thompson, Oneida, N. Y. and figured in the *Rural New Yorker*, 1892, page 569. In cane and fruit it closely resembles the Shaffer. The seed was planted in the spring of 1888 and in 1892 the number of plants had increased to over 10,000. It is now being introduced by Mr. Thompson as a variety of much promise, especially for canning. Its name was chosen at the suggestion of Prof. S. A. Beach of Geneva, N. Y., who reported in 1892 as follows: "The most productive of all the raspberries fruited on the station grounds this year. Fruit large to very large, moderately juicy, moderately firm, nearly sweet, somewhat

darker in color than the Shaffer, but sweeter and better flavored. So far as tested here, its growth has been rather more vigorous and also somewhat more subject to injury by winter than the Shaffer. It begins to ripen a little later than the Shaffer and likewise continues to ripen fruit after the fruiting season of the Shaffer has closed. It was still ripening fruit Aug, 7, when the bushes were dug out, to prepare a site for a new building. It gave the larger part of its yield between July 18 and Aug. 2, while the Shaffer gave the greater part of its yield between July 16 and July 28."

At the Michigan Agricultural College it is more vigorous and more hardy than Shaffer; the plants however are younger.

COMMON RED. A general term for the wild red raspberry (*Rubus strigosus*) and also formerly used to designate the Purple Cane when that variety was the leading market sort near New York City.

CONOVER. See CUTHBERT.

CONRATH. [Black Cap.] (*Conrath's Early.*) An early or midseason black cap discovered in 1886 by Mr. C. H. Woodruff as a chance seedling near a patch of the Gregg on his place near Ann Arbor, Michigan. In 1888 the plant produced its second crop and was so promising that it was further propagated until in 1891 the number of plants reached 10,000, when the stock was sold to the Conrath Brothers, of the same place, after whom it was named. After having been further tested for two seasons at various experiment stations and by private growers it was introduced to the public in the spring of 1894. The plant is fairly vigorous, very productive, the fruit of a large size, moderately firm, nearly coal black, and parts readily from the core. Although early it has a long season and holds its size well to the end.

COPE. [Red, *Idæus.*] (*Vice President Cope.*) One of the seedlings originated by Dr. W. D. Brinckle of Philadelphia and named by him in honor of Caleb Cope, Esq., vice president of the American Pomological Society for the state of Pennsylvania in 1852. It is described as having light green foliage, red spines, and large, conical, crimson fruit.

CORNISH. [Red, *Idæus.*] An English variety recommended by Johnson, mentioned in Gardener's "Farmers' Dictionary," N. Y., 1846.

COX'S HONEY. [Yellow, *Idæus.*] An English variety of medium size and yellowish-white color, recorded in the "superseded list" by F. R. Elliott in 1865.

CRAIG. [Red.] A seedling of unknown parentage originated about ten years ago by Prof. Wm. Saunders, of Londen, Ont., and named in honor of Prof. John Craig, the horticulturist of the Central Experimental Farm of Canada, who says: "The berry is large, rather conical, dark red, of the season of Marlboro, fairly firm and of good quality. It is a good grower and very prolific." Plants have been sent for trial to the branch experimental farms.

CRAWFORD. [Black Cap.] Moderately productive, hardy, ripening with Hilborn (S. T. Maynard, Hatch Exp. St., Amherst, Mass., Bulletin 21, 1893, p. 11).

CREAM. [Black Cap.] A "yellow cap" mentioned by William Parry in 1870.

CRETAN RED. [*Idæus.*] Said by W. R. Prince of Flushing, Long Island in 1832, to have been recently introduced by him from the Mediter-

ranean. Described by A. J. Downing in 1845, as follows: "Canes upright, branches dark gray with few bristles; leaves rather narrow, dark green but very light colored upon their lower surface. Fruit of medium size, roundish conical, deep purplish red, sub-acid, ripening about two weeks after the Antwerp." Said to be adapted to light soils, and to be comparatively hardy, but it has never been grown to any extent in this country.

CRIMSON BEAUTY. [Red.] Found in 1875 by Dr. J. Stayman of Leavenworth, Kansas, growing upon his grounds in a patch of Imperial. Being evidently something new (not having the dark spines of that variety) and appearing desirable he propagated it and finally sold the stock to A. M. Purdy of Plamyra, N. Y., who named it "Crimson Beauty" and introduced it to the public. By some this variety has been considered to be the same as Imperial. Mr. Stayman explains this impression by saying that some of his neighbors, knowing how the variety originated, and believing it to be nothing new, began to fill eastern orders out of their own stock of "Imperials." The Crimson Beauty is of medium hardiness and vigor, among the earliest to ripen, being possibly a little later than the Hansell but larger when well grown than that variety, and of a beautiful red color. It is of only medium firmness, fair quality, and drops too readily when ripe. Its greatest fault is a lack of pollen, which causes it to be unproductive unless planted near some other suitable variety, and also causes such fruit as it bears when standing alone to be imperfect and crumble easily.

CRIMSON CLUSTER. Seldom mentioned and probably an error. See Crimson Beauty.

CRISTINE. [Red, *Idæus.*] A late, large, conical variety sent out by E. P. Roe. The editor of the *Rural New Yorker* said in 1886 that it was not hardy at New York oftener than one year in three.

CROMWELL. [Black Cap.] (*Butler.*) Introduced in 1890 by the Hale Brothers of Connecticut. As to its origin T. T. Lyon writes that in March, 1890, he received it (yet unnamed) the second time for trial from G. S. Butler of Cromwell, Ct., and recorded it as "Butler," under which name he had also recorded it when first received in 1887. It was reported by Mr. Lyon under that name in 1889 in a bulletin of the Michigan experiment station, but since its introduction under the name of Cromwell in 1890 the old name has been dropped. It is supposed to have been an accidental seedling discovered by Mr. Butler. In character it is much like the Souhegan and others of that class, with nothing to especially recommend it above other varieties.

CRYSTAL. (*Crystal White.*) A seedling originated by A. J. Caywood of Marlboro, N. Y., prior to 1888, and said to be four or five days earlier than Golden Queen, of a bright yellow or straw color, and therefore handsomer than that variety, though possibly not so prolific. S. A. Beach of the N. Y. experiment station at Geneva says: Canes moderately vigorous, pale in color, of the *Idæus* type, and rather tender; moderately productive. Fruit medium or above, clear pale yellow, moderately firm, moderately juicy, of good quality and flavor.

CUSHING. [Red, *Idæus.*] The originator, Dr. W. D. Brinckle of Philadelphia, made in 1846 the following statement: I named it Cushing in

honor of J. P. Cushing, Esq., of Boston. It originated from a seed of the new Double Bearing, imported by Robert Buist of this city. The seed was planted June 27, 1843 and vegetated in the spring of 1844, fruiting first in the autumn of 1845, producing one berry. This summer [1846] it began to ripen June 12. Fruit large, roundish conical, crimson; leaf regular in form and much plaited; prickles brown.

CUTHBERT. [Red.] (*Conover, Lost Rubies*, erroneous; *Queen of the Market*; *Quinby's Favorite.*) Originated in the garden of Thomas Cuthbert, Esq., of Riverdale, New York (now a part of New York City) some twenty-five years ago. It was but little known until 1880, when its merits were recognized by the publisher of the *Rural New Yorker*, who in that year distributed it extensively to the subscribers of that journal. It became at once immensely popular, and it is not too much to say that it created a new era in the cultivation of the red raspberry for market. Previous to that time this fruit was grown extensively for market only in limited localities near a few of the large cities. The Cuthbert however proved to be adapted to the most diverse situations, and as it was of large size, firm texture, good color and excellent flavor it proved an almost ideal market berry. Its defects which have been noted, are not serious. One of these is a tendency to become soft and settle in the boxes in hot weather towards the close of the season if the berries are allowed to get overripe. Its large core and cavity no doubt account for this in some measure. The canes, though fairly hardy, are not absolutely so, and on strong soil, or in low damp places where the growth is excessive, it occasionally winterkills. Thus in central Ohio, where the soil is rich and the winters severe, reports are most conflicting. In 1888 the experiment station at Columbus reported that the Cuthbert had never given a crop there, and was perhaps the most unsatisfactory of all red varieties. F. R. Palmer of Mansfield, Ohio, states that with him it fails on cold clay soil, but does well on sand. T. T. Lyon, of Michigan, reported in 1883 that with him on strong soil on the lake shore in western Michigan it was a sparse bearer, but that in the eastern portion of the state it did well. Its essential hardness however is indicated by the success with which it is raised in Canada, where it is now the leading market berry. P. C. Dempsey of Ontario, writes that with him it is always hardy, and all things considered is the best single variety. A. H. Pettit of Grimsby, Ont., writes: "I have seen the Cuthbert two seasons in Manitoba perfectly sound without being frozen back and perfecting good crops. In August and September they usually have dry weather. The wood ripens and matures and is not killed back." In the northwestern states winter protection is often required. J. M. Smith of Green Bay, Wisconsin writes that he likes it so well that he has plowed up all other kinds. He protects in winter by bending the canes over and placing earth on the tips, then covering with straw. Professor Budd of Ames, Iowa, reports that it is the best variety with him, though it requires protection in winter. In the south it it also popular. T. V. Munson of northeastern Texas states that although no raspberries thrive well enough there to be profitable the Cuthbert does the best as it roots deeply and stands the drouth well. In Alabama it is exceeded in popularity only by the Turner, and no other red varieties are profitable there. In Florida it also attains a measure of success. In Georgia President Berckmans of Augusta reports that it stands the heat of the summer well and is being largely planted for market along with the Gregg. E. J. Wickson wrote in 1891 that it was the most popular variety in California.

Although the parentage of the Cuthbert is unknown it is supposed from its appearance to be of the native red species. Its hardiness against both cold and heat, strong rampant growth, and the character of its foliage show little evidence of foreign blood. Still it was originally found as a single plant growing in the edge of a patch of Hudson River Antwerp. A detailed account of its discovery and introduction is given by the son of Thomas Cuthbert in E. P. Roe's " Success with Small Fruits."

The synonyms *Conover* and *Lost Rubies* were names under which one or two nurserymen sold the Cuthbert, for a short time. The latter is now applied to a different variety. *Queen of the Market* has been more widely used, and seems to have been first applied to this variety in Delaware and New Jersey, where it was quite largely cultivated for market before being generally introduced. Concerning *Quinby* Mr. E. Williams of New Jersey wrote as follows in 1891: "A few years ago I was one of a club to purchase 10,000 or more plants of "Quinby's Favorite Raspberry." The party furnishing the plants stated that it came to him in a lot of Cuthberts and proved so superior that he was rooting out all other varieties and planting this. He knew and cared nothing about its origin. When our plants fruited a small portion of them appeared so near like the Cuthberts I could tell no difference. The remainder, fully two-thirds, produced a smaller roundish berry, many of which were inclined to crumble. After getting three or four crops I became disgusted and tore the plants all out. So far as I have learned the venture with the other members of the club met the same fate."

DAILY BEARING. [Black Cap.] Originated a short time prior to 1860 by Mr. B. Griggs of Perry county, Ohio, from seed of the Ohio Everbearing. He claimed that it fruited continuously from early in the season until frost.

DAVIS. [Black Cap.] A " yellow cap," said to be a few days earlier than the Golden Queen, and as hardy as that variety, found on the banks of the New river, North Carolina, some ten or twelve years ago by an old lady by the name of Davis, who introduced it into cultivation. It was brought into notice by the late L. P. Hodges of Sands, that state, whose son, Chas. P. Hodges, furnishes this information and states that the variety has given good satisfaction.

DAVISON. [Black Cap.] (*Davison's Thornless.*) Said to be an accidental seedling of the native black cap, which originated in the garden of Mrs. Mercy Davison of Gowanda, Erie county, N. Y., and was sent out by Joseph Clinton of Argola, some time prior to 1866. Canes rather slender, somewhat wanting in vigor, and not fully hardy; fruit rather small, sweet and pleasant, ripening several days earlier than the Doolittle, and formerly considerably planted on this account. In productiveness it is, however, unreliable, especially at the south. It was added to the catalogue of the American Pomological Society in 1873 and dropped ten years later.

DELAWARE. Said to be an American seedling of the Hornet, fairly productive, in one trial found equal in hardiness to the Brandywine, but less hardy than Cuthbert. Fruit large, bright red, but apparently lacking in quality. Added to the catalogue of the American Pomological Society in 1881 and dropped at the next session in 1883.

DIADEM. [Red, *occidentalis* x *Idæus.*] Charles Arnold's account of the origin of this variety is given by him substantially as follows in the report of the Commissioner of Agriculture and Arts for Ontario for 1875,

p. 312: "In the spring of 1860 I began hybridizing the raspberry by applying pollen of the old Franconia upon the pistil of the old White Cap, or what used to be called the White Black Cap; and out of a large number of seedlings produced from this cross, only two showed the least signs of having been affected by the pollen of the Franconia. These two were red and very inferior looking. They threw up suckers and would not root from the tips. These two varieties were again crossed with the White Four Seasons, imported from France for this purpose, the object being to produce fall bearing varieties. From this second cross several much improved varieties were produced—some red, some white, but all throwing up suckers and refusing to root from the tips. Some of these were excellent fall bearers and of good flavor. The Red and Yellow Canada and Orange King were thus produced and sent out by me in 1868. But fall bearers did not prove so valuable as was expected, and the Orange King being very hardy, productive, and of excellent flavor, I again crossed it by using pollen of Hornet, Imperial and Belle de Fontenoy. The raspberry illustrated at the title page of this report is a seedling selected as one of the best of a large number produced by this cross. In my opinion, it is the largest, most highly flavored, and most productive yellow variety ever grown in this country." In 1892 T. T. Lyon reported this variety in a bulletin of the Michigan experiment station as early, of large size, ovate, red, of good quality, but lacking in vigor. It seems never to have found its way any further into cultivation.

DICTATOR. A cross between the Shaffer and the Gregg, produced by Luther Burbank of Santa Rosa, Cal. Color said to be bright red, canes much like the Shaffer, but shorter, propagating by suckers; fruit larger than the Shaffer. Not yet introduced.

DOOMORE. [Black Cap]. A seedling found between two rows of Doolittle by Gustus Swabley of Tiffin, Ohio, in 1884, and sent out for trial the following year to the Ohio experiment station. Afterwards plants were sent to T. T. Lyon of South Haven, Mich. These plants, Mr. Swabley afterwards found, were from a lot in which various seedlings of the Gregg had become mixed. He now thinks he has the variety pure again. He describes it as a tall, erect grower, with deep blue canes, fruit without bloom, about the size of the Ohio, ripening somewhat earlier, and the most productive of the twelve varieties grown by him.

DOOLITTLE. [Black Cap.] (*Joslyn's Improved Black Cap.*) The interest taken in our native black raspberry by Mr. H. H. Doolittle of Oak Corners, near Geneva N. Y., along about 1850 and the years immediately following, mark the turning point in bringing this excellent wild fruit into general cultivation, and more than any other influence led to the discovery of other and better sorts. For a long time previous, as far back at least as the beginning of the present century, wild bushes from the woods had been occasionally transferred to the family garden. As early as 1832 an autumnal bearing fruit of the species had attracted notice and was brought into cultivation under various names, but generally known as the Ohio Everbearing. This, however, was not adapted to market purposes and it was not until Mr. Doolittle's time that this fruit began to be grown to any extent for market. Mr. Doolittle's was not the only influence in developing the market qualities of this fruit, for other growers about 1850 were already raising the black cap in considerable quantities for the New York and other eastern markets. Mr. Doolittle, however,

conceived the idea that by selecting the most productive and best wild specimens and giving them good care under cultivation, and particularly by continual propagation by tips from young plants only, he could materially increase their vigor and productiveness. Whatever merit there may have been in this supposed method of improvement (and it cannot be doubted that it possessed some lasting good, besides being the method of obtaining the most vigorous plants for immediate propagation) it is certain that in his efforts along this line Mr. Doolittle attracted such attention to the possibilities of the black cap as a market fruit as it had never received before. His "Improved Black Caps" were for sale by all the leading nurserymen and quickly took the place of chance selections from the woods in general cultivation. In 1860 the American Pomological Society formally applied the name "Doolittle" to this variety, if such it can be called, it having been first brought to the notice of the Society two years previous. As an instance of the rapid development of the raspberry as a market fruit about that time, it may be remarked that in 1865 in Berrien county, Michigan, the planting of the Doolittle and Philadelphia raspberries for the Chicago market had increased to the point of overproduction, so that prices fell to an unprofitable figure and the plantings thereafter for a term of years were largely reduced. The Doolittle is still regarded by many as a valuable variety for cultivation, particularly in the south. It is hardy, vigorous and productive, canes rather stiff, upright and thorny; season early in comparison with most varieties now grown, though not the earliest; size small, color black, quality good, form round, texture rather soft. Though the Doolittle is now a well characterized variety it has not been supposed to have had a distinct and single origin. One account, however, is that it was found growing wild about 1845 by Leander Joslyn of Phelps, Ontario Co., N. Y., and afterwards introduced by Mr. Doolittle.

DOOLITTLE'S RED FLAVORED BLACK CAP. See GARDEN.

DOUBLE BEARING. [Red, *Idæus.*] (*Perpetual Bearing, English Double Bearing Red, Siberian, Late Siberian, Late Cane, Double Bearing Red Antwerp.*) A comparatively hardy, late, autumnal bearing variety with large, dull red fruit, imported in 1843 by Robert Buist of Philadelphia and apparently by W. R. Prince of Long Island some fifteen years earlier. It possessed no special merit and was never largely cultivated.

DOWNING. [Red, *Idæus.*] (*Downing's Seedling.*) Recorded by Fuller in 1867 as belonging to the Antwerp class and similar to the North River Antwerp but probably more productive. Parry said in 1870 that it and all other varieties of foreign blood, failed with him in New Jersey.

DUHRING. [Red, *Idæus.*] A seedling of Hornet originated by Henry Duhring of Philadelphia and figured in the *Gardener's Monthly*, 1866. Said by Thomas Meehan, to be superior to the Hornet, but seems never to have been much cultivated outside of Philadelphia, though said to be hardy there. Wm. Parry said in 1870 that it failed with him in New Jersey. Described by Charles Downing as vigorous, with numerous, rather weak, slightly purplish spines; fruit large, roundish obtuse, deep red or crimson; grains large, rather soft and sweet, berry separating freely from the core.

DUNCAN. [Black Cap.] (*Kentucky Prolific, Kentucky Mammoth.*) Reported in 1875 to the American Pomological Society by J. S. Beatty of

Kentucky as a new variety from Bullitt county, highly recommended by the fruit committee of Kentucky for cultivation in the northern district of that state. It was never placed however upon the catalogue of the society. A. M. Purdy, who advertised it extensively, describes it as equaling the Gregg in size, but blacker and earlier, and turning a pinkish yellow before ripe. It is said by another writer to have been a chance seedling found on the farm of Jack Smith in Jefferson county, by a man by the name of Duncan. Louis Ritz of Ohio reported the "Kentucky Mammoth" in 1873, having obtained it some time previous from Kentucky.

DYACK'S SEEDLING. [*Idæus.*] Imported by Robert Buist of Philadelphia about 1840, and known only as the parent of Brinckle's Orange.

EARHART. [Black Cap.] Introduced in 1887 by the Hale Bros. of So. Glastonbury, Ct., after having been grown for a number of years in Mason county, Illinois, where it was found wild about 1870. In 1889 it was admitted to the catalogue of the American Pomological Society with one star for Michigan. It is perhaps the best of the everbearing black caps, producing a moderate crop on the last year's canes at the usual season, and a second crop in September upon many of the new canes of the current year. This second crop is quite liable to be ruined by frost before full maturity. The plants are vigorous and healthy with stout spines and peculiar wrinkled foliage. There is some complaint of its being tender, doubtless owing to a weakness of the canes as the result of fruiting in autumn of the first year. The fruit is a glossy black, though somewhat pubescent, quite firm, of medium quality, sweet and rather small. At the New York experiment station at Geneva, in 1893, it was the earliest to ripen among the fifteen varieties of black caps on trial, and also the least productive. The fruit was of a dull unattractive color.

EARLY ANDREWS. See ANDREWS.

EARLY OHIO. See OHIO.

EARLY PRIDE. See THOMPSON'S EARLY PRIDE.

EARLY PROLIFIC. [Red, *strigosus.*] Originated with O. L. Felton of Merchantville, Camden County, New Jersey, in the same manner as the Reliance, by sowing for several generations the seed of the Philadelphia. It seems to have been first exhibited at the Centennial Exposition in 1876. Apparently productive at the north but not at the south. See also THOMPSON'S EARLY PROLIFIC.

EASTERN KING. In regard to the origin of this variety Mr. O. A. Hill of Deering, Maine, writes under date of February 19, 1894: "In the year 1864 I purchased a lot in what was then the town of Westbrook, this state. I made a garden upon the same and shortly after discovered a cluster of raspberries growing thereon. There were no raspberries cultivated there at this time, but the lot had formerly been a nursery. When this fruit ripened I was surprised at its size and productiveness. The fruit was a dark red, very sweet and juicy. Not having ever seen anything to equal it, I regarded it as a new variety and named it 'Eastern King.' It is larger, earlier and more productive than the Cuthbert, with stout, half hardy canes. A few years ago a party in Connecticut wanted to secure control of this variety but as we could not agree upon terms the deal was not made. I am not now in the nursery business but still cultivate and control the plants."

Mr. James M. Hayes of Dover, New Hampshire, states that the variety was sent to him for trial by Mr. Hill who claimed that it was a hybrid between the native and the Franconia.

Mr. T. T. Lyon of Michigan, after testing this variety, regarded it as of little promise. He described it a few years ago as ripening with the Cuthbert and rated it low (6) in vigor, hardiness and yield; size, medium; quality, mild and poor; round, soft, dull red. Recently, however, his reports are more favorable.

EBON BEAUTY. [Black Cap.] Planted for trial at the Indiana experiment station at Purdue in 1890 and reported two years later as inferior to the Gregg in all respects except hardiness, with a shorter season than that variety, but ripening quite as late. The originator, F. L. Piers of Barden (formerly called New Providence), Ind., writes that he found the original plant growing by the roadside in a piece of woodland in 1887, where it was so productive that he removed it to cultivated ground for propagation and named it as above. It is not yet offered for sale.

EBONY. [Black Cap.] (*Farnsworth.*) A mid-season black cap, originating as a chance seedling about 1885 on the farm of W. W. Farnsworth of Waterville, Ohio. It has been sent out for trial, but is not yet offered for sale. It ranked tenth in yield among the fifteen varieties of black caps on trial at the N. Y. experiment station at Geneva in 1893. It was reported as medium to large, firm, very seedy, moderately juicy, sweet and good.

ELIZABETH. [Red.] One of the seedlings raised by D. W. Herstine of Philadelphia from seed of the Allen grown near, and supposed to have been fertilized by, the Philadelphia. It was named, together with several other of Mr. Herstine's varieties, by a committee from the Pennsylvania Fruit Growers' Society, who visited his grounds Aug. 6, 1870. It was described as productive, large, crimson or scarlet, firm and of delicious quality, ripening late.

ELLISDALE. [Purple Cap.] Recorded by Fuller as new in 1867. Said to have originated on the Ellisdale farm in Iowa. Much like the old Purple Cane, and hardly an improvement on that variety. Admitted to the Michigan fruit catalogue in 1878, but rejected ten years later. Size large, form roundish oblong, color purple, but by some described as deep red or crimson. Season medium, quality very good, but unsuitable for market. Said by Mr. Hathaway of Michigan to be rather more vigorous than the Purple Cane, but the fruit not so large or abundant, and apparently not so juicy and good, though possibly firmer. Propagated evidently from the tips, as it is said not to sucker.

ELM CITY. [Red.] Described by Chas. Downing in 1869, on the authority of Mr. Trowbridge, as somewhat like the Philadelphia, but earlier. It seems to have originated at New Haven, Ct., from which it apparently derived its name "Elm City." It was exhibited at a horticultural meeting by W. Parmelee of that place, who claimed it to be a week earlier than either Clarke or Franconia. By some it was regarded as of poor quality. Mr. Purdy seems to have considered it a synonym of Highland Hardy.

ELSIE. [Black Cap.] Said to be a seedling of Surprise, but it is too much like it to need a separate name.—A. S. Fuller, *Michigan Farmer*, 1874, p. 259.

EMILY. [*Idæus.*] A seedling of the Col. Wilder, raised apparently by Dr. Brinckle of Philadelphia and mentioned by Dr. J. A. Warder in 1861. It is described as large, conical, or sometimes round, often distinctly shouldered, of a light yellow color. Canes vigorous and furnished with white spines.

EMPEROR. No information is at hand concerning this save that it appears to have been a black cap and the statement that a colored plate of it was published by A. M. Purdy of Palmyra, N. Y., in his catalogue in 1871.

EMPIRE. On trial at the experimental farm at Agassiz, B. C.

ENGLISH BLACK. [Red, *Idæus.*] Recorded by Chas. Downing in 1869 as an old English hybrid of moderate vigor with numerous purplish spines. Fruit medium sized, roundish, dark crimson or purplish; grains medium to small, compact; flesh rather firm, brisk sub-acid, separating freely from the core.

ENGLISH BROWN. See PURPLE CANE.

ENGLISH DOUBLE BEARING RED. See DOUBLE BEARING.

ENGLISH GLOBE. [*Idæus.*] Described by Chas. Downing in 1869 as vigorous, with short, purplish and moderately numerous spines; fruit large, obtusely conical, dark crimson, soft, sweet and juicy.

ENGLISH PURPLE. See ENGLISH RED CANE AND PURPLE CANE.

ENGLISH RED. See PURPLE CANE.

ENGLISH RED CANE. (*English Purple, False Red Cane, Allen*). F. R. Elliott records under this name and synonymy, a variety much grown in 1865 by market gardeners and described by him as having canes which were tall, bluish red, with a whitish gray bloom, hardy and productive; fruit medium to large, globular or slightly conical, dull red, with large grains, moderately firm, juicy and pleasant but not of high flavor.

ENGLISH SUPERB. [*Idæus.*] A red variety catalogued by Ellwanger & Barry of Rochester, N. Y., in 1860.

ERIE. See GLADSTONE.

ERWOOD'S EVERBEARING. [Red.] On trial on the grounds of the *Rural New Yorker*, near New York City in 1879, and reported as one of the hardiest red varieties.

EUREKA. [Black Cap.] Reported from the Ohio experiment station in 1892 as equal in size to Gregg and nearly as early as Palmer, being similar to Kansas but earlier. It was discovered growing wild on the farm of Jacob Smith in Miami Co., Ohio, by J. C. Kester of New Carlisle, that state, about eighteen years ago. See MOHLER.

EUREKA. [Purple Cap.] A seedling of the third generation from Shaffer, from which it differs in being larger and of a brighter red. It originated with Luther Burbank of California and is owned by John Lewis Childs of Floral Park, N. Y., who expects to introduce it under another name.

EVERBEARING RED. R. B. Whyte, of Ottawa, Canada, writes: "From a friend in Montreal about 10 years ago. The summer crop proved very small, and we never got more than a few scattering berries in the fall, as they were always caught by early frosts. I think it belonged

to the Antwerp type. It was large, rather soft, somewhat like Herstine, but not so good." See SALZER'S EVERBEARING RED.

EVERLASTING. [Black Cap.] In the *Rural New Yorker* for 1882, page 669, is described under this heading a variety received, apparently without name, from Lawrence county, Pa., with the statement that it was found wild some years previous in Newcastle county, that state. It is described as bearing throughout the fall on the new canes and rooting from the tips sparingly.

EVERY DAY. Dr. J. A. Warder is reported as follows in the *Michigan Farmer* for 1870, p. 505: "This is thought to be the same as the Ohio [Ohio Everbearing] but with me it is a much more continuous bearer, fruiting almost constantly until frost. Fruit large, gray-black, moderately juicy, ripening quite early."

EXCELSIOR. [Red.] Said by G. J. Kellogg, of Janesville, Wis., in 1887, to have originated in that state, apparently by a Mr. Sneclode, who he said had been offered one thousand dollars for the plants in stock. Mr. W. O. Aldrich of Columbus, Ohio, reports a red variety under this name, said to be everbearing, as worthless with him.

EXTRA LATE. See HANNIBAL.

FALSE RED CANE. See ENGLISH RED CANE.

FASTOLFF. [Red, *Idæus.*] (*Filby.*) An English variety first brought to notice, according to A. J. Downing, by Messrs. Youell of Norfolk, England, in December, 1842, and stated by them to have been cultivated for several years previous near Fastolff castle in Great Yarmouth, from which circumstance it obtained its name. It was introduced the following year into the United States where it soon became popular on account of its handsome appearance, large size and fine flavor. It is regarded as a probable seedling of the Red Antwerp, with which it ripens, though on account of its softer texture it did not become so popular as that variety for market. Its canes are strong, brittle and branching, eight or ten feet high, light yellowish brown with rather strong bristles. As compared with the Antwerp the canes are stouter and more upright. The fruit is more roundish or obtuse than in that variety, bright purplish red, of the richest flavor and adheres slightly to the core. It has a long season and is still popular in the east as a family berry. The spelling above given is the one commonly used for the name of this variety, though the correct form is probably "Fastolfe." In the reign of Edward I, Thomas Fastolfe founded a great hospital in Great Yarmouth, which in 1851 was converted into a grammar school. This is probably the "castle" above mentioned.

In the Album de Pomologie, tome. IV, 1831, p. 87, is the following account of this variety: "Originated 24 or 25 years ago in the garden of Colonel Lucus at the Filby House near Yarmouth. For a number of years it was cultivated only in the vicinity of the village of Filby, and has been known on the continent only four or five years."

FAY. [Black Cap.] Commended by A. S. Fuller in 1874 as a valuable early variety with few thorns and firm black fruit with very little bloom. It was tested and reported upon favorably by the editor of the *Rural New Yorker* the year previous.

FILBY. See FASTOLFF.

FLESH COLORED. [*Idæus.*] Introduced from the Mediterranean by W. R. Prince a short time prior to 1832 (Pom. Man. pt. II, p. 169).

FLORENCE. [Black Cap.] A "yellow cap" of New Jersey origin, introduced about 1880, and described by the *Rural New Yorker* in that year as the best of its class, equaling in size the Mammoth Cluster with which it ripened. Plant fairly vigorous and productive but less hardy, either north or south than the ordinary black cap. Though better than Golden Thornless and some of the other varieties of its kind it has the same deficiency in flavor and tendency to turn brown when overripe.

FONTENOY. See BELLE DE FONTENOY.

FOUR SEASONS RED. [*Idæus.*] (*Merveille de Quatre Saisons* [Marvel of Four Seasons], *October Red.*) Introduced from France, probably about 1857. It is now little grown and of no value for market, but still retained in the catalogue of the American Pomological Society on account of its habit of bearing uncommonly well in autumn. It is roundish conical, of large size, red color, and of very good quality.

FOUR SEASONS YELLOW. [*Idæus.*] (*White Four Seasons.*) Imported from France in 1863 by Charles Arnold of Paris, Ontario. Said to be a seedling of the Four Seasons Red and similar to it in all respects, save color, which is light yellow.

FRANCONIA. [*Idæus.*] (*Abel.*) Said by A. J. Downing in 1845 to have been imported some years previous from Vilmorin of Paris under this name by Samuel G. Perkins, Esq., of Boston. The name however did not appear in any foreign catalogue. It endures the severe climate of New England better than the Antwerp and has long been a favorite family berry with many in that section of the country. Among those who have grown it may be mentioned Benjamin G. Smith of Cambridge, Mass, who stated in 1881 that he had grown it for 20 years upon the same piece of ground. He still regards it as the best variety he has for family use. Among others with whom it has been a favorite are A. D. Capin of Mass. and J. S. Woodward of Lockport, N. Y. It has been recommended for cultivation in Ontario, Canada, and in at least fifteen states of the union. Its foliage is injured by the sun however from New York City southward. Its canes are vigorous, upright and sparingly branched, yellowish brown, with rather few, stout purplish spines, leaves deep green, rather long and narrow, thick, firm and deeply veined but less wrinkled than other kinds. Season a week later than the Red Antwerp; fruit large with large seeds, roundish conical, red, comparatively firm, of excellent flavor, more tart than the Antwerp and most foreign varieties. T. T. Lyon stated that many years ago it was a great bearer and lasted nearly a month, and as compared with the Fastolff was firmer, of smaller size and of superior flavor.

FRENCH. [Red, *Idæus.*] (*Vice President French.*) A seedling produced by Dr. W. D. Brinckle of Philadelphia by artificial cross fertilization of the Fastolff with the pollen of the Yellow Antwerp. It was placed among the promising red varieties by the American Pomological Society in 1854 and finally added to its catalogue, but it never became very popular. It was a rather large, fine round sort of mid-season, said by President Wilder to be vigorous and of good quality but apparently unproductive. It was named apparently in honor of H. J. French, vice president of the American Pomological Society for New Hampshire in 1852.

FULTON. [Red, *Idæus.*] A seedling of French raised by Dr. Brinckle of Philadelphia, and named apparently in honor of Jas. D. Fulton of Pennsylvania, an officer of the American Pomological Society in 1852. It is described as vigorous and productive, with large, round, conical fruit.

GANARGUA. [Purple Cap.] Discovered about 1870 on Ganargua Creek near Farmington, Ontario County, N. Y., by Stephen Katkamier of that place and propagated and introduced by him. It is generally regarded as a hybrid between the red and the black raspberries, the fruit being variously described as of a dark crimson, purple, or brownish. The canes resemble those of the black cap and root readily at the tips but have only weak, though quite numerous spines. The fruit is said to commence to ripen with the Davison, being earlier therefore than any other hybrid variety. It is described as large and firm but lacking in flavor. The foliage is said to be more rugose than in most raspberries and is reported from Pennsylvania as liable to injury in hot weather. The variety was dropped from the Michigan fruit catalogue in 1885.

GARDEN. [Black Cap.] (*Doolittle's Red Flavored Black Cap.*) Recorded by Chas. Downing in 1869 as a bright colored, acid, black cap.

GARDINER. [Black Cap.] A promising sort mentioned by A. S. Fuller in 1867.

GARNET. On trial at the experimental farm at Agassiz, B. C.

GENERAL NEGLEY. Dr. J. A. Warder said in 1870: A seedling, probably from one of the large foreign varieties, Pilot, Hornet or Franconia, originated by Gen. Negley of Pittsburg. It is vigorous, of foreign aspect and foliage, stood the past winter well, is productive, rather early; fruit large, roundish, oblong, juicy, high flavored and very good. Will prove a favorite if hardy.

GENERAL PATTERSON. See PATTERSON.

GENESEE. [Red]. A fairly productive red variety sent out for trial in 1888 by Mr. Z. H. Harris, of Rochester, N. Y. Canes moderately vigorous, tender, said to be of the *Idæus* type; fruit large, scarlet, soft and of good quality.

GLADSTONE. [Red.] (*Carpenter's No. 2, Erie.*) Originated as a chance seedling, probably of the Catawissa, by Chas. Carpenter of Kelley's Island, Ohio (in Lake Erie), some 18 or 20 years ago, and sent out by him in a small way about 1886, first as Carpenter's No. 2, then as the Erie. Green's Nursery Co., of Rochester, N. Y., introduced it in 1891 under the name of Gladstone as a hardy, vigorous and productive everbearing variety. It has not generally sustained its reputation for productiveness and does not appear to always bear in autumn. Chas. A. Green now writes that it is valuable only as a continuous bearer for which purpose its new canes only should be allowed to grow, while to obtain the best results it should be transplanted every three years. The canes are vigorous and the fruit round, of medium size, fair quality, rather soft, nearly sweet, crimson or purplish when very ripe.

GOLDEN ALASKA. Introduced by the late John A. Salzer of LaCrosse, Wisconsin, in 1891, with the statement that it possessed great size and excellent flavor and was found in one of the valleys of Alaska. The John A. Salzer Seed Co. write that they have no other information as to its history.

GOLDEN CAP. [*Occidentalis.*] This, the most popular of the white or yellow caps, seems to have originated as a seedling of the old White Cap in Cedar county, Iowa, about 1860. It is hardy, productive and somewhat larger than other varieties of its class. See AMERICAN WHITE CAP.

GOLDEN MAYBERRY. A supposed cross of the Cuthbert upon the *Rubus palmatus* of Japan, produced by Luther Burbank of Santa Rosa, Cal., and described by him as the earliest raspberry ever known, ripening there in April, a month before Hansell. It is propagated by suckers. It is now being introduced by John Lewis Childs, Floral Park, N. Y.

GOLDEN QUEEN. Found growing among his Cuthberts by Mr. Ezra Strokes of Berlin, New Jersey, about 1880, and supposed by him to be a sport or albino form of that variety. It is generally described in both plant and fruit as identical with the Cuthbert in all respects except color. Its supposed origin is probably correct, but its albino condition has evidently affected both plant and fruit beyond the mere color. Although generally said to be as hardy, vigorous and productive as the Cuthbert it appears to be somewhat inferior in all these respects to that variety, particularly at the south. Its quality has been said to be surpassed only by that of the Brinckle's Orange, but it seems to differ in this respect from the Cuthbert only in being more mild; when wet or overripe its flavor is noticeably deficient. It is now the favorite yellow variety in most localities, though its color renders it unpopular for market.

GOLDEN THORNLESS. [Black Cap.] Introduced from Minnesota by A. M. Purdy of Palmyra, New York, prior to 1869 and described by Chas. Downing in that year as moderately vigorous, very productive, having few spines; fruit large, equaling the McCormick, oblate or conical, with slight bloom, dull orange color, rather firm, juicy and sweet. It was added to the catalogue of the American Pomological Society in 1873, and dropped in 1883 on account of its color. Reported from the experiment station at Geneva, New York, in 1893 as having vigorous, whitish canes with slender branches, fruit medium, moderately firm but inclined to crumble.

GREAT WESTERN. See GREGG.

GREEN. [Black Cap.] Discovered on the grounds of Green's Nursery Co., near Rochester, New York, about 1890, and described by them as large, productive and early.

GREGG. [Black Cap.] (*Great Western.*) Discovered growing wild about four miles south of Aurora, Indiana, on the farm of Messrs. R. & I. Gregg in 1866 and removed by them to a suitably prepared piece of ground near their residence.

In 1872 clusters of the fruit were exhibited by Messrs. Gregg before the Clark and Floyd Horticultural Society, where it met with almost unbounded favor. The action of the society was reported at this time in the *Indiana Farmer.* They next brought it to the notice of the Indiana State Horticultural Society in 1873. In July, 1875, it was shown at a meeting of the Horticultural Society of Cincinnati, and in 1876 it was sent to the Centennial Exposition at Philadelphia, where it received its introduction to general notice. Mr. N. Ohmer of Dayton, Ohio, was the leading introducer of this variety.

Its increase in popularity since introduced has been rapid, and it is now the best known and most largely cultivated black cap variety. It was the

largest, latest and most vigorous variety known, at the time of its introduction, and it is not yet surpassed in either of these particulars by any well known sort. It is less hardy than most other black caps, but is generally safe from injury by cold in nearly all that portion of the United States lying east of the city of Chicago and the Mississippi river. In the south it appears to be more successfully grown than most other black cap varieties. The following statement will indicate its liability to be injured by cold and other causes in the north. In Connecticut J. H. Hale reports it injured badly in the severest winters. At Grand Rapids, Michigan, Charles W. Garfield reports it tender at his place in an exposed situation on light, sandy soil, but hardy a few miles away on clay land. In central Ohio it prefers dry, warm, sandy soil, and on heavy land runs out or becomes unproductive sooner than other varieties, or after giving about three or four crops. Its failure on low, strong soil is not due wholly to winter killing, for in such situations anthracnose has proved very destructive, particularly in the states of Ohio, Indiana and Illinois. At Green Bay, Wis., J. M. Smith says it is covered in winter by bending the canes to the ground, placing earth on the tips, then covering the whole with straw. In most parts of Iowa it produces a crop without winter protection no oftener than once in four or five years, or not frequently enough to be profitable. In that state, where the Gregg was killed to the ground, the Ohio and Hopkins were reported as giving half a crop. Young plants were less liable to be killed than those which had produced two or three crops. The Gregg reproduces itself to a considerable extent from seed, and many valuable varieties have been derived from it. Under ordinary conditions it is probably not exceeded in productiveness by any other variety. Ohio, and other varieties of its class, are more prolific, but unless given good care their fruit is apt to be small, and a portion of it to dry upon the bushes in some seasons without ripening. The Gregg, being more vigorous, withstands drouth and poor treatment better and its fruit comes to maturity in better condition. A comparison of the evaporated product from nine varieties at the Ohio experiment station in 1888 showed the greatest amount of valuable food per bushel to be produced by the Gregg, though a greater weight of dried product was furnished by the Ohio. In regard to the quality of the Gregg some difference of opinion exists, and it cannot be doubted but that there are other black cap varieties having a more distinct and pleasant flavor. With most persons, however, its flavor appears to be entirely satisfactory. Its appearance as a market fruit is somewhat marred by the presence of an unusual amount of gray bloom or pubescence upon the fruit. In firmness it is all that could be desired.

GRIESA. See CARDINAL.

HAMILTON. [Black Cap.] Recorded by Charles Downing in 1881 as coming from Shelby County, Tenn., and said to be a fine large variety of good quality.

HALE'S EARLY. [Black Cap.] From Hale Bros., So. Glastonbury, Conn. Named and tested at the Geneva, N. Y., experiment station, where it proved so inferior that the original stock has been destroyed, and Messrs. Hale will not introduce it.

HANNIBAL. [Black Cap.] (*Extra Late.*) Sent for inspection to Mr. Van Deman of the U. S. Department of Agriculture in 1891 by W. J.

Brandt of North Hannibal, N. Y., under the name Extra Late. Upon the recommendation of Mr. Van Deman the name was changed to "Hannibal," under which name it was published with description and figure in the report of the department for 1892. It is said to be several days later than Gregg, apparently vigorous and productive, of large size and excellent quality.

HANSELL. [Red.] A chance seedling discovered on the farm of J. S. Hansell (now Hansell Bros.) near Beverly in Burlington County, N. J. about 1875, and largely planted by them for market before being introduced to the public by J. T. Lovett in 1882. The plant is moderately vigorous, suckers freely, and is characterized by dark reddish green shoots and foliage, the latter finely wrinkled and the shoots covered with an abundance of hairy prickles. The variety is among the first to ripen, often the earliest, and is valuable and considerably planted on that account. Its season however is quite short, so that some consider the Turner and other varieties more profitable. The fruit is more firm than the Turner, though not large nor of high quality; color dark red. The variety is very hardy, though sometimes injured in trying situations. Said to withstand drouth and heat uncommonly well, but reported as not hardy from Alabama. Charles A. Green stated that it is one of the varieties that are difficult to transplant or to propagate from root cuttings. The following statement was made by the Hansell Brothers in 1885: "The Hansell was originated and fruited by us several years before we found the Rancocas. Before fruiting the Hansell, the Brandywine was the only berry that we could grow with any degree of profit. Finding that the Hansell was earlier, quite as productive, as good a shipper and as large a berry as the Brandywine, we propagated it for our own plantings with no thought at that time of raising plants for sale, and entirely ceased growing or planting the Brandywine. Meanwhile we discovered the berry we named the Rancocas growing in a most unfavorable spot and its attractiveness induced us to give it a trial. It proved to be a berry as large as or larger than the Hansell of similar color, quite as good a shipper, much more vigorous, more productive and, taken as a whole, a great improvement on that variety. On plantations standing side by side we are usually able to make one picking of the Hansell before we do a picking of the Rancocas; but at the second picking of the Hansell we can gather more Rancocas than we can Hansell. The bulk, and usually the whole crop, of the Rancocas, ripens within a period of two weeks, some years in ten days; while the Hansell covers a period of from three to four weeks. Thus as regards the bulk of its crop the Rancocas is earlier than the Hansell. We have fruited the Rancocas as a market crop for several years, and find it as far ahead of the Hansell as the Hansell is ahead of the Brandywine. It has the constitution and sufficient vigor to succeed in very trying situations."

HARRIS. [Red.] Sent out for trial by Mr. R. Harris of Rochester, N. Y., in 1889. Reported in 1893 from the N. Y. experiment station at Geneva as of the *strigosus* or native type with dwarf but vigorous canes; fruit medium to large, nearly sweet, firm, and of fine flavor.

HARRISON. [Black Cap.] Named in honor of President Harrison by Henry S. Harris of Whig Lane, Salem Co., N. J., who brought it to notice. Mr. Harris says he first observed it more than 20 years ago, it having come up in a neighbor's garden, and possessing the peculiarity of fruiting on the young canes until cold weather killed the blossoms. For a long

time it was neglected until the owner was about to move away, when the plants were given to Mr. Harris who states that he now has two rows in his garden and has picked over six bushels of berries from 40 hills during one season. He has made no effort to propagate it largely or to sell the plants and none appear yet to have been grown by anyone else. The variety is here recorded chiefly from the fact that fruit of it was exhibited in 1891 at a meeting of the American Pomological Society in Washigton, D. C. and described in the report of its committee on new fruits. This report described the fruit as medium to large, firm, rather dry, black, with less bloom than the Gregg. Mr. Howard A. Chase of Philadelphia, representing R. G. Chase and Co., of Geneva, N. Y., appears to have placed the fruit on exhibition, it having been brought to his attention by some of his agents who had seen it growing on Mr. Harris' grounds. Mr. W. A. Taylor writes that further details are on file in the Department of Agriculture at Washington, D. C.

HASKELL'S YELLOW. [Black Cap.] Taken from Massachusetts to Illinois by a Dr. Haskell about 1836. Several favorable reports appeared in the Illinois Agricultural Report about fifteen years later. Since then it has been rarely mentioned.

HEEBNER. [Red.] John Craig of the central experimental farm at Ottawa, Canada, reported as follows in 1892: "A large red berry of the Clarke and Hornet type, in quality first class, but not firm enough for distant shipments. It has been on trial at Ottawa for the past four years, having been planted in 1888 by the former Horticulturist, Mr. Hilborn, now of Leamington. The canes are not quite as hardy as those of the Cuthbert, but the fine quality of the fruit should give it a place in all amateur collections. It needs winter protection in this locality."

Mr. Hilborn writes: "The Heebner was grown from seed of the wild raspberry found in Muskoka. The foliage is not however like the common wild berry, but like the European sort. The fruit is as large as or larger than the Cuthbert, of better quality, and perhaps a week earlier. It has not been very much grown in western Ontario and I cannot say how it will generally succeed, but wherever it succeeds it is the best raspberry with which I am acquainted. I hope to introduce it soon."

The county of Muskoka, where this variety originated, lies east of the Georgian Bay. Mr. Hilborn stated in 1886 that the man who sent it to him had fruited it in the northern part of that county for several years.

HENRIETTA. [Red.] First seen growing in the midst of a large current bush in the garden of Mrs. E. Morley of Wethersfield, Ct., in 1870, no other raspberry being in the garden, though several varieties were growing in the garden of a neighbor, from which source the seed is supposed to have come. The plant bore fruit from the second year of its discovery, and as it appeared to be promising it was placed in the hands of the Hale Bros., of So. Glastonbury, who named it and introduced it to the public. When introduced this variety was claimed by many to be the Belle de Fontenoy, and it is still catalogued by some nurserymen as a synonym of that variety.

HERSTINE. [Red.] In July, 1870 a committee from the Pennsylvania fruit growers' society, with other pomologists, including B. K. Bliss, A. S. Fuller and Dr. George Thurber, visited the grounds of Mr. D. W. Herstine of Philadelphia, for the purpose of inspecting several promis-

ing varieties of seedling raspberries originated by him. They had been produced from seed of the Allen, plants of which had grown in alternate rows with those of the Philadelphia, and all were reported as large sorts of excellent flavor. To four of these the committee gave names. The Herstine, being the most promising, was named after the originator, the others being called Elizabeth, Ruby and Saunders. Mr. H. M. Engle, secretary of the Pennsylvania horticultural association writes in January, 1894 that he visited Mr. Herstine's place to see the new variety in bearing and that it was one of the finest sights of raspberries that he ever saw, but that he had himself never been able to produce such a show of Herstines. He adds that he has always grown the variety since, but never largely for market or sale, as it is not so hardy as the more popular varieties. For quality, however, in his opinion, it is unsurpassed. He describes it as larger than the Cuthbert, not a rampant grower but sufficiently so compared with other varieties, never badly hurt by cold with him, but injured more or less in severe winters. Reports concerning this variety from New York, New England, Michigan, Ohio and adjacent states indicate that it is wanting in hardiness. It appears also to be slightly deficient in pollen, which sometimes diminishes its productiveness and causes the formation of imperfect berries. It is late to ripen, has a long season, too soft for a distant market, but of fine flavor and appearance. Mr. Wm. Parry described it in January, 1871, as large as Hornet, bright as pearl, hardy and productive as Philadelphia and as delicious as Allen. The report of the committee from the Pennsylvania fruit growers' society is as follows: "Plant a good grower, most abundant and early bearer, suckers moderately, canes strong, of a pea green color, covered with white bloom, spines green but not abundant, foliage healthy, of medium size, often lobed and of a pearl gray color on the under side; fruit large, oblong, with small grains, of crimson color, flavor sub-acid and very good." In E. P. Roe's "Success with Small Fruits" is an account of the visit of this committee by B. K. Bliss.

HIGHLAND HARDY. [Red, *strigosus.*] (*Highland Antwerp.*) Mr. H. Hendricks of Kingston, New York, writes: "The Highland Hardy raspberry originated about 25 years ago as a sport or chance seedling on the farm of the late Nathaniel Palmatier about a mile from Highland village on the Hudson river, in Ulster county, New York."

It was largely cultivated in that locality as an early variety for the New York market for several years prior to 1880, when it gave way to the Cuthbert, Marlboro and other sorts. It has never been popular outside of the state of New York, and the lower provinces of Canada. It had a place at one time in the Michigan catalogue but was dropped in 1888. South of the latitude of New York its foliage is injured by the sun, thus weakening the canes causing them to winter-kill. In general appearance of fruit and bush it somewhat resembles the Turner (though earlier), and like that sort is supposed to be of the native species. The fruit is small, firm, somewhat conical, light red, and of moderate quality.

HILBORN. [Black Cap.] Introduced in 1886 by W. W. Hilborn of Leamington, Ontario, after having been fruited by him for six years. Mr. Hilborn writes that it was an accidental seedling taken with a large number of others from an old raspberry plantation. About one acre was planted to these seedlings and the Hilborn was selected after two years' fruiting as the best. Most of the seedlings were worthless. It ripens

midway between the Tyler and the Gregg. It appears to be best known in Ohio and Ontario, where, with many, it is a favorite on account of its hardiness, productiveness, vigor, good appearance, and excellent flavor. A report from the Ohio experiment station says that it ought to supersede the "Ohio," being fully equal to that variety in all respects, and superior to it in quality and beauty.

HILDRETH. [Purple Cap.] Introduced by Isaac Hildreth, of Big Stream Point, Yates county, New York, prior to 1867 and said by him to have been found wild near that place. It propagates sparingly, either from suckers or tips. The canes are clothed with numerous, stiff, purplish spines, fruit of medium size, roundish, oblate, dull red or maroon color with a thick bloom, only moderately firm, sweet, juicy, sub-acid, in flavor much like the Purple Cane.

HIRAM. [Red.] Sent by W. J. Brandt of Hannibal, New York, to the Pomological division of the United States Department of Agriculture in 1891, and described by Mr. VanDeman as large, with a large rough core, conical, pale crimson, with light bloom, of good quality, but hardly as firm as the Cuthbert. He states that it shows traces of the Antwerp parentage. First offered for sale by John Lewis Childs of Floral Park, New York in 1893.

HIXON. [Black Cap.] (*Hixon's Everbearer.*) Recorded in the fruit catalogue for the northern district of Kansas in 1889, ranking fourth in order of preference among the mid-season varieties and also appearing at the foot of the list of the late varieties.

HOOSIER. [Black Cap.] (*Hoosier Mammoth.*) Little appears to be known of this variety, if there be such a one. E. Y. Teas of Indiana, writes in February, 1894 that he suspects it to be a local or canvassers name for a large fruit already named. Lovett, in 1881, found it in no respect superior to the Gregg. Samuel Miller of Missouri, about the same date considered this variety, the Centennial and the Gregg the three best black caps.

HOPKINS. [Black Cap.] The history of this variety is given as follows in a letter from the introducer, Major Frank Holzinger, of Rosedale, Kansas, written January 28, 1894: "During the year 1872 Mrs. Dr. Maloney, now a resident of Shawnee, Kansas, sent a boy into the woods for some raspberry plants. This, the Hopkins, was one. It promised well. During the grasshopper plague of 1874 and 1875 this variety, which had been propagated, was destroyed, save three plants. Mr. G. W. Hopkins of Springfield, Missouri, secretary of the Missouri Valley Horticultural society, found it in this condition and cared for it, and the society named it in his honor. Mr. Hopkins, leaving his farm to engage in other business, I purchased the stock and disseminated it. It originated within the present limits of Kansas City, Missouri. My place is on the state line in Kansas only one-fourth mile from Kansas City, Missouri."

Mr. Holzinger adds, that he still regards the Hopkins as the best variety of its class, taking into consideration hardiness, productiveness, sprightliness, and shipping qualities. Norman J. Colman, of St. Louis reported that it was larger, better, hardier and pulpier or less seedy than the Gregg. T. T. Lyon of Michigan describes it as of the same general character as the Tyler, differing but little in flavor, size medium to large, round, with bloom only between the pips, soft for a black cap, and of mild

flavor. A bulletin of the Ohio experiment station says that reports concerning it are generally favorable and that it can be safely planted where a medium early sort is wanted. See also remarks under BABBITT.

HORNET. (Pronounced Hornay.) [Red, *Idæus.*] A French variety originated by Souchet near Paris, and introduced to America about 1858. Described by Dr. J. A. Warder in 1861 as enormously productive, of large size and fine flavor. It is figured in the *Horticulturist* for September, 1866. It appeared for several years in the Michigan fruit catalogue, with the indorsement "good, but tender," and is still retained in the catalogue of the American Pomological Society with single stars for New York, Pennsylvania, Ohio and Indiana. It is described as vigorous and upright, with rather sturdy purplish spines, numerous towards the base, large, red, conical, often irregular fruit, separating freely from the core, the grains large, hairy and compact, firm, juicy, sweet and good. Season medium.

A writer in the *Germantown Telegraph* in 1877 stated that an autumnal bearing variety was being erroneously sold under the above name. The true Hornet was of a dark maroon color and bore no autumn crop, though it lasted about six weeks. It was, he said, the largest raspberry grown. His plants were originally purchased from a French firm in New Jersey [Berckmans ?] which had imported the variety directly from France.

HOWLAND'S RED ANTWERP. See RED ANTWERP.

HUDSON RIVER ANTWERP. (*North River Antwerp, New Red Antwerp.*) Charles Downing stated that its origin was unknown but that it seemed to have been imported by Mr. Briggs of Poughkeepsie, N. Y. E. P. Roe, in his "Success with Small Fruits," adds, on authority of Downing, that Mr. Briggs obtained it while on a visit to England, while it was then a new variety there, not having yet been introduced into cultivation. Mr. Roe gives a detailed history of its introduction into cultivation in the Hudson River valley. Its decline, he adds, was largely due to "curl leaf."

This variety was for twenty-five years or more the leading market sort along the Hudson where it appeared to give better satisfaction than anywhere else. It was tender even there, however, and was nearly always protected in winter. One writer, in 1859, suggested that it was the same as the "Red Cane" of Hartford, Conn., and vicinity, but as he spoke of it as "hardy" there may be some doubt. R. W. Starr of Nova Scotia wrote that it succeeded with him better than the Red Antwerp. A. S. Fuller stated that it failed on the sandy soil of Long Island. Its record in the American Pomological Society is one star each for Nova Scotia, Vermont, New Jersy, Ohio, Michigan, Nebraska, Utah, Georgia; two stars for New York, Oregon and South Carolina. It is described as having the stems vigorous and stocky, though shorter and more slender than the Red Antwerp, nearly spineless, of a peculiar gray or mouse color; fruit even larger than the Red Antwerp, oblong conical, rather dull red, with a slight bloom, firm, and not very juicy, but of the best quality, very sweet and pleasant, and parting freely from the core. Season medium. A figure may be found in Thomas' "Fruit Culturist" (1885), page 465.

HUDSON RIVER RED. A name which appears only in connection with a native red variety exhibited before the Cincinnati Horticultural Society in 1860 by F. W. Slack of Kentucky, who was at that time growing it for the Cincinnati market.

HUNTSMAN'S GIANT. [Red, *Idæus*?] A variety, probably of the foreign species, said to have been originated by Prof. T. W. Huntsman of Fushing, Long Island.

HUNTSVILLE. See PURPLE CANE.

HYBRID CRIMSON MAMMOTH. [Purple Cap.] Found wild at Adams, New York, in 1872, by Dr. E. R. Maxson who brought it into cultivation and described it in the *Horticulturist*, but as far as known never introduced it.

IDAHO. [*Leucodermis?*] Sent out for trial by F. R. Palmer, of Mansfield, Ohio, in 1890.

Mr. Palmer writes: "I received it from Mr. Ellis, a gardener living at Dayton, Washington. He recommended it very highly, said it was the largest raspberry he ever saw and very early. It ripened early with me, but not more than three days before Palmer and was not nearly so good a variety in any respect. I sent a few plants to one or two state experiment stations before testing it enough to judge of its merits, relying on the description given me by Mr. Ellis. It came from the mountains near Lewiston, Idaho (so Mr. Ellis informed me), hence I called it 'Idaho.' It is of no value here."

IMPERIAL. [Red, *Idæus.*] Charles Downing, quoting from the *Gardener's Monthly*, in 1869, described it as a large, firm, bright red, French variety, with pale green, almost white canes. A. S. Fuller about the same time spoke of it as a much extolled foreign sort, no better than many of our older varieties.

IMPERIAL RED. Charles Downing mentioned it in 1869 as grown in New Jersey, and hardy there, the fruit of medium size, roundish, scarlet, half firm, juicy and pleasant. P. J. Berckmans stated in 1877 that it was the only red variety that succeeded in Georgia, but in 1883, on motion of Samuel Hape, of that state, it was dropped from the catalogue of the American Pomological Society.

IMPERIAL WHITE. [*Idæus.*] A new, large, white variety catalogued by Ellwanger & Barry in 1860.

IMPROVED BLACK CAP. See DOOLITTLE.

IMPROVED MIAMI. See MCCORMICK.

INDIANA. [Black Cap.] T. T. Lyon recorded this as received in 1884 from Indiana, and he described it in 1889 as ripening a little before the Gregg, fairly vigorous, hardy, the fruit firm, of medium size and quality. Three years later he reported the plants as very productive but lacking in vigor. The following winter the plants were badly injured and the fruit next season was a small crop and ripened with the Tyler.

IRON CLAD. See SMITH'S IRONCLAD.

JACKSON'S MAY KING. [Black Cap.] Catalogued by Storrs & Harrison in 1887 as "May King," and stated by Lovett in 1892 to be no earlier than the Souhegan, and not so fine.

JOHNSON. [Red.] Received from Cincinnati, by E. Y. Teas, of Indiana, in 1875, and reported by him after a brief trial to be much like the Philadelphia.

JOHNSON'S SWEET. [Black Cap.] (*Key's Prolific.*) Mr. Robert Johnson, of Shortsville, N. Y., writes that he received this variety in 1883

from John B. Hoag, Judsonia, Arkansas, where it had been growing in a Mr. Key's garden for twenty years. Mr. Johnson sent it to the New York experiment station for trial in 1885 under the name Key's Prolific, but introduced it to the public in the following year as "Johnson's Sweet." He states that it does well on sandy land, but is too weak a grower to succeed generally. At the Ohio experiment station it was affected more than other varieties by the blight. It is described as being similar in habit to the Tyler, but more upright and ripening a little later. Fruit large, black, firm and peculiarly mild in flavor.

JOSLYN. See DOOLITTLE.

JOUET. [White, *Idœus.*] A French variety described by Chas. Downing in 1869 as having yellowish green canes, whitish spines; fruit small, elongated, conical, bright lemon yellow color, with a whitish bloom, soft and sweet but of only moderate flavor.

KAGY'S EVERBEARING. [Black Cap.] On trial at the Ohio experiment station at Columbus, Ohio, in 1888.

KANSAS. [Black Cap.] A. H. Griesa, of Lawrence, Kansas, the originator and introducer of this variety, says: "Some years ago I planted largely of raspberry seeds, but out of six to nine hundred plants (some of which were good) had none equal to one that came up by chance on my grounds in the spring of 1885. It fruited the following year, and in 1888 I sent plants unnamed to friends for trial. The first plants were sold in 1890 at $1 each or $10 per dozen. I had not been able to grow raspberries with profit because after a year or two the leaves would drop in August, which stopped the growth of the branches and gave no chance for plants. The Kansas from its first growth, when only a few inches high, presented such an appearance of health and vigor that it was saved; other seedlings in adjoining rows dropped their leaves more than any other kind in cultivation. One feature in the Kansas that I never saw in any other variety is that some of the tips will grow from the layered plants in the fall, sometimes two to four feet high, and stand uninjured the next winter. Others will grow above ground and make a bunch of leaves like a strawberry plant and force a surprising growth the next season, while still others will remain dormant like the other varieties."

The season of the Kansas is later than that of the Souhegan, but much earlier than that of the Gregg, which it is said to equal in size, exceed in productiveness and surpass in color. The stout canes are quite thorny and covered with a thick bluish bloom. The Kansas is described and figured in the report of the United States Department of Agriculture, 1891, on page 394, where it is stated that reports concerning it from all parts of the country are very favorable. At the Michigan experiment station it had quite badly winter-killed. Another variety, also known as the Kansas, will be found recorded under the name McCracken.

KELLOGG. [Black Cap.] Originated as a chance seedling by George J. Kellogg, Janesville, Wis., about 1875, and claimed to be hardy, vigorous and productive, with about the same season and appearance as the Doolittle. It is grown by Mr. Kellogg and a few others for market.

KENTUCKY. [Black Cap.] See DUNCAN.

KENYON. Introduced by O. A. Kenyon, of McGregor, Iowa, who found it growing in an old row of black raspberries about 1885. No other red raspberry grew upon the premises, but a row of Shaffers stood about

fifty feet distant, from which the seed is supposed to have come. Unlike the Shaffer, however, it increases by sprouting from the root. At the college grounds at Ames, Professor Budd has found it apparently hardy, with canes very large and strong, large, rough, with dark glossy green foliage and no rust or other disease during the four years it has fruited; fruit large, abundant, firm, dark red, with fine bloom.

KERR'S WHITE. [Black Cap.] Reported from the Michigan experiment station in 1892 as having been on trial for over three years, and proved to be a large, second early variety of moderate vigor, and productiveness with light yellow pubescent fruit.

KEY'S PROLIFIC. See JOHNSON'S SWEET.

KIMBALL. [Black Cap.] Reported by Joseph H. Bourn of Providence, R. I., to the American Pomological Society in 1885, as a promising new variety, earlier than the Souhegan. He writes later that it was found by him growing as a chance seedling on the farm of James Kimball, near Providence, but that it was never introduced, and had apparently disappeared.

KING. See JACKSON'S MAY KING and THOMPSON'S KING.

KIRTLAND. [Red, *Indœus.*] (*Cincinnati Red.*) Discovered by Dr. J. A. Warder some time prior to 1858, growing in the garden of Professor A. J. Kirtland, M. D., the distinguished naturalist and pomologist of Cleveland, Ohio. Although Professor Kirtland believed he had obtained it somewhere else, it was not recognized as any known variety, and was therefore given his name. It seems to have been named and introduced by H. B. Lum, a nurseryman who purchased Prof. Kirtland's place. A figure and description are published in the report of the U. S. Department of Agriculture for 1866. The canes are vigorous, upright, light yellow, not much branched, clothed with few, rather weak whitish spines, sucker numerously; season very early and rather short, ripening before the Purple Cane or the Davison; fruit of medium size, about the same as the Philadelphia or smaller; firmer than that variety, not very juicy, nor of high flavor, grains small, light crimson, with a slight bloom, separating freely from the core. The variety is uniformly hardy at the east, and often also at the west, but is liable to injury by the sun at the south. Its season, though early, is comparatively short. Rejected from the Michigan fruit catalogue in 1888.

KNEVETT'S ANTWERP. See RED ANTWERP.

KNEVETT'S GIANT. [Red, *Idœus.*] Introduced from England by Marshall P. Wilder in 1843, and at one time quite extensively cultivated for market, but now hard to find. It was an excellent variety, much like the Red Antwerp, but rather more hardy. Described as large, conical, deep red, early, of excellent quality and flavor, and an abundant bearer.

KIREIGH. [Red.] Recorded in the *Gardener's Monthly* for 1880 as firm, nearly equal to the Herstine in size, and more hardy; larger than the Turner and more productive.

LADY ANNE. On trial at the experimental farm at Agassiz, B. C.

LARGE FRUITED MONTHLY. See RIVERS' LARGE FRUITED MONTHLY.

LARGE FRUITED RASPBERRY. See RED ANTWERP.

LATE CANE. See DOUBLE BEARING.

LINDLEY. [Red.] Originated by Joseph B. Lindley of Newark, N. J., early in the "sixties." Said to be a hybrid between the Fastolff and the native red, and said at the time of its introduction to be the largest of the native varieties. It is described as tall, vigorous and branching, too much inclined to sucker, not fully hardy, with numerous stout, greenish spines; fruit medium to large, conical, but not sharply so, crimson, rather soft, juicy, sweet and good, adhering slightly to the core, with rather large, compact grains. The correct spelling of this name may be "Lindsley." Parry, for, example, speaks of "*Lindsley's Fastolff Seedling*" as unproductive with him in New Jersey.

LINTON. [Red.] Mentioned by William Parry, of N. J., in 1870, among the varieties that failed with him.

LITTLE'S PROLIFIC. [Red.] A chance seedling sent out in 1883 by Joseph Little, of Granton, Ontario, who writes that it is no longer cultivated. It was described by T. T. Lyon as having slender, branching canes without spines, bearing an early and abundant crop of medium sized, roundish fruit, moderately firm, juicy and sprightly, of a light purplish red color.

LOGAN. The following is from *Garden and Forest*, 1894, p. 30: Professor E. J. Wickson, of Berkely, California, is sending out plants of what is called the Logan Berry, which appears to be a cross between the cultivated red raspberry and a variety of the Californian wild black berry. It was raised from seed by Judge J. H. Logan, at Santa Cruz, in 1884, and bears fruit of striking characterists. The berry is sometimes an inch and a quarter long, shaped like a black berry, colored like a dark red raspberry and combines the flavor of the two. On the experiment grounds of the University station it has fruited for three years. It is hard and ships well and has been successfully marketed in quantity. The foliage seems rust proof, and no other diseases have been noticed on the plants.

LORD BEACONSFIELD. On trial at the experimental farm at Agassiz, B. C.

LOST RUBIES. [Red.] Said by A. M. Purdy to have been found growing in a bed of Naomi on his place at Palmyra, N. Y., and sent to Charles A. Green of Rochester, N. Y., by whom it was introduced. It is claimed by Mr. Purdy and some others that it is the Naomi, but most reports indicate the contrary. It was also at one time regarded as a synonym for the Cuthbert, but the variety now grown under that name is clearly distinct from the Cuthbert. It is a rather small, round, dark red variety, several days earlier than the Cuthbert. The Ohio experiment station in 1885 made the following report: "*Lost Rubies.*—Under the name of Naomi this variety was once favorably known. The plants are quite hardy and productive, but the fruit is quite soft and crumbles badly, hence does not sell well in market. In quality, however, it is excellent, and is very superior for canning purposes. There are many better varieties, and it is for that reason discarded by nearly all growers."

LOTTA. [Black Cap.] (*Brackett No. 101.*) Reported to the American Pomological Society in 1887 by G. C. Brackett, of Lawrence, Kansas, now secretary of that society, as a large, new, glossy black, vigorous, hardy variety, very firm, sweet and juicy. It originated on Mr. Brackett's place as a chance seedling and is supposed to be a cross between his No. 20 and the Gregg, as these were the only varieties on the premises. Mr. Brackett

states that it begins to ripen a week before the Gregg and continues in bearing about a week longer than that variety. He is growing it for market but has not yet introduced it. Reports from the various stations and private growers who have it on trial are very favorable. The Pennsylvania station reports it as vigorous and thorny with the largest fruit of any black cap on trial.

LOUDON. [Red.] Originated by Frank W. Loudon of Janesville, Wis. and reported by Mathew Crawford of Ohio in 1893 as having been fruited by him for three years and found to be the best of all red varieties, of large size, productive, and of good color and quality. Mr. Loudon writes under date of February 28, 1894: "The Loudon is a seedling of the Turner crossed with the Cuthbert, now ten years from seed, and has fruited eight seasons. Will have two and one-half acres to fruit the coming season. It is as large as the Cuthbert, quality about the same, firm, never drops from the stem, yields enormously here, and is very hardy, the canes (which I have just examined) being entirely uninjured, while the Turner along side of them has about one quarter of the wood killed. The winter has been very severe for about two months, the mercury having dropped several times to —28°. I have also 20 unnamed seedling red raspberries, six of them exceeding the Cuthbert in size and productiveness."

E. S. Carman, of New Jersey, reports it after one year's fruiting as likely to supersede the Cuthbert, being more vigorous, apparently perfectly hardy, practically thornless; fruit averaging larger than that of Cuthbert, drupes larger and firmer, adhering well to the stem, never crumbling, bright red, becoming darker when dead ripe, roundish conical, but somewhat variable in shape, commencing to ripen with the Cuthbert and holding out longer. It is now owned by Charles A. Green of Rochester, N. Y., who will introduce it in the fall of 1894. (*Rural New Yorker, 1894, p. 274.*)

LOVETT. [Black Cap.] Found among a lot of wild seedlings transplanted from the fence rows on the grounds of Mr. Ezra Wood of Ohio. They were planted by a previous owner, and this plant was recognized by Mr. Wood as especially valuable about 1875. Some years later at the suggestion of a neighbor, Mr. C. C. Cornett, vice president of the state horticultural society, it was propagated and the stock sold in 1888 to Mr. Lovett of New Jersey for $1,000. It is nearly thornless but has otherwise the general characteristics in bush and fruit of the Souhegan, Palmer and others of that class.

LUM'S EVERBEARING. [Black Cap.] (*Lum's Fall Bearing.*) A variety much like the Ohio Everbearing but nearly thornless, originated by H. B. Lum of Sandusky, Ohio, about 1860. Admitted to the Michigan fruit catalogue in 1878 and rejected in 1883. Described as of medium size round, black, of good quality, rather soft and of little market value.

LUM'S YELLOW CANADA. [Black Cap.] An everbearing variety about which little is known.

MACOMBER. There is no variety properly of this name, though it has been temporarily applied, with numbers or letters appended, to seedlings originated by J. T. Macomber, Adams, Vt., and L. M. Macomber, North Ferrisburgh, Vt. Mr. J. T. Macomber appended numbers to his seedlings when sent out for trial, while his brother L. M. Macomber designated his varieties by letters. See CHAMPLAIN and VERMONT.

MAGNUM BONUM. [Yellow, *Idæus.*] A light yellow variety originating in England prior to 1865.

MAMMOTH CLUSTER. See McCormick.

MARLBORO. [Red, *Idæus* x *strigosus.*] The originator. Mr. A. J. Caywood, of Marlboro, N. Y., stated as follows in 1881: "Fifteen years ago I crossed the [English] Globe with the Hudson River Antwerp and produced a large, fine flavored and hardy variety, but the berries were sometimes imperfect. I crossed this with the Highland Hardy, or Native, and produced the Marlboro."

The variety was introduced to the public in the fall of 1884 by an association of some ten or twelve nurseymen who purchased a portion of Mr. Caywood's stock of plants. "That method of introducing new fruits," says one of these gentlemen, "was a failure, as there were more plants than could be sold at the high price asked." In 1885 the Marlboro was added to the catalogue of the American Pomological Society and has gained slowly in popularity since. It is quite hardy, but appears to be more sensitive to unfavorable soil than the Cuthbert and many other varieties, so that complaints are quite frequent that it lacks productiveness. In the south it is subject to injury from the hot suns, a defect attributed to the foreign blood it contains. The season is early, but a long one, as it commences to ripen before the Turner and continues in bearing nearly as long as the Cuthbert. The plant is of medium vigor, stocky, sparingly branched, and has but few suckers. The color of the fruit is of a peculiar light red or pink, quite showy. It is of good size, round, of only fair quality and sufficiently firm for market.

MARY. On trial at the experimental farm at Agassiz, B. C.

MAY KING. See Jackson's May King.

McCRACKEN. [Black Cap.] Originated by William McCracken, of Sunnydale, Kansas, and distributed by him under the name of Kansas. Another and much better known variety, however, is grown under that name.

MELLOTT'S FAVORITE. See Muskingum.

MENDOCINO. A Pacific coast variety said to have originated in Mendocino county, Cal. It is said to be a fine sort bearing large fruit, which is very sweet. Luther Burbank, of Santa Rosa, Cal., has produced some interesting seedlings and hybrids from it.

McCORMICK. [Black cap.] (*Mammoth, Cluster, Collinsville Miami, Large Miami, Improved Miami,* etc.) Charles Downing described this variety with the above synonyms in 1869 as the largest and best black cap he had yet seen; the canes stronger, with fewer spines, the fruit larger and deeper in color than the ordinary black cap, with more bloom, juice and sweetness. This variety appears to have been derived from the Old or Small Miami, and to have originated or become first known at Collinsville, Ind. It is not mentioned by Warder in 1861, the Miami described by him being evidently the old variety. The new variety was very slow, however, in becoming known until taken up and advertised by A. M. Purdy about 1867 and named by him Mammoth Cluster. From that time until the introduction of the Gregg it was the most valuable and best known of all the black cap varieties in cultivation. It ripens fully a week later than the Doolittle, the "old" Miami ripening about with that variety. Its color is somewhat bluish, flavor milder or less sprightly than that of the Old

Miami and the ordinary black caps, and therefore considered by some inferior, but generally regarded as very good.

MEREDITH QUEEN. [Yellow, *strigosus.*] Discovered growing wild in the town of Meredith, Delaware county, N. Y., in 1880, by E. J. Brownell, of Franklin, now of Delphi, that state, who sent out plants for trial in 1883 and offered them for sale two years later, but has now discontinued its cultivation. It is figured in the *Rural New Yorker* for 1884, p. 797. T. T. Lyon, of Michigan, reports it as later than the Cuthbert with a short season, and wanting in vigor, size of fruit, productiveness, firmness and quality. Color, a beautiful pale orange with a trace of crimson. The Geneva, N. Y., experiment station reports in 1893: Fruit medium in size, reddish salmon color, juicy, moderately firm, good; season late; not very productive. It has the distinction of being the only strictly wild, yellow *strigosus* known to have been introduced into cultivation.

MERKEL. [Purple Cap.] Reported to *Popular Gardening* in 1888 by Mr. John Rupp, who stated that it was a red variety with the habit of the black cap, and producing no suckers.

MIAMI. [Black Cap.] (*Old Miami, Small Miami.*) An old variety said by Downing to have been originally found growing along the Miami River in Ohio. It ripens about with the Doolittle, some reports saying a little earlier, some a little later. Size medium, no larger than the Doolittle, if as large; color black, but of a distinct brownish red cast; quality excellent, being juicy and tender, but not especially sweet. Plant exceedingly vigorous and productive.

MICHIGAN. [Red.] (*Michigan Early.*) Introduced about 1883 by Wm. Parry, of N. J., but supposed to have been originated in Michigan. Wm. Parry, Jr., writes that he thinks the first plants came from Tennessee, but is not certain. Season medium; plant lacking in vigor and productiveness; fruit rather small and of inferior quality, moderately firm and quite hardy; form roundish conical; color dark red.

MILLER'S DAILY. [Black Cap.] (*Miller's Daily Bearing.*) Originated, according to E. Y. Teas, of Indiana, about 1858. W. B. Lipsey, of Marion, Ind., stated that he received it in 1870 from a friend by the name of Isaac Miller, in the southern part of Ohio. Mr. Lipsey found it the best of a dozen black caps on trial. It is best known in Ohio.

MILLER'S FAVORITE. [Red.] On trial at the Michigan Agricultural College in 1887.

MILLER'S WOODLAND. [Red.] On trial at the New York and Michigan experiment stations since about 1885. Suckers freely. Canes with few spines, moderately vigorous, slender, hardy, of the *strigosus* type. Fruit bright crimson, medium size, not juicy, firm, good quality; mid-season to late. It does not rank high, either in productiveness or as a late berry.

MINNESOTA. [Black Cap.] Said by F. R. Elliott in 1883 to be of no special value.

MILLS NO. 1. [Black Cap.] Prof. S. A. Beach of the Geneva, N. Y. experiment station reported for 1893 the growth very vigorous, slightly injured at the tips by the winter. Fruit large, firm, seedy, moderately juicy, sweet and of good flavor and quality. Ranks fifth on the list for

productiveness for 1893 and second only to Mills No. 15, in the amount of fruit produced late in the season.

MILLS NO. 7. [Black Cap.] Prof. S. A. Beach of the New York experiment station reported for 1893: "Growth very vigorous; tips of canes slighlty injured by winter. Fruit large to very large, moderately juicy, sweet, good in flavor and quality. The most productive black cap on the station grounds in 1893, and in the whole raspberry plantation exceeded only by the Shaffer and the Columbian. First fruit picked July 10, last picking August 1. Four-fifths of the crop was picked within the six days from July 14 to July 19, inclusive. It seems to be worthy of extended trial. So far as tested here it has proved to be a desirable aquisition to the black raspberry list on account of its very large size, fine appearance, good quality and productiveness. It appears to be as hardy as the Shaffer."

MILLS NO. 15. [Black Cap.] Prof. S. A. Beach of the experiment station at Geneva, N. Y., reported in 1893: "From Chas. Mills, Fairmount, N. Y. Growth very vigorous, canes injured by winter twice as much as those of Mills No. 7; fruit medium to large, smaller than in that variety; firm, fine flavored, juicy, sweet, very good to best in quality. In productiveness it ranked second on the list in 1893, and in yield of late fruit it stood first."

Mr. Mills writes that this has a gray bloom like the Gregg. All of his seedlings were grown from the seed of the Gregg which had been grown near the Tyler. The above three varieties are selections from two hundred plants raised from seed sown in 1884. All three were sent for trial to the Geneva station in 1891.

MOHLER. [Black Cap.] Originated by D. M. Mohler, New Paris, Ohio, from seed of the Eureka, planted by him in the fall of 1885. Mr. Mohler states that it differs from its parent in being more stocky and upright and inclined to have but one or two canes in a hill; fruit firmer, averages larger, and has a longer season. It seems that before the introduction of this variety the name Mohler was for a short time applied to the Eureka, which may account for the supposition in the minds of some that the two varieties are identical.

MRS. WILDER. [Yellow, *Idæus.*] Recorded by Elliott in 1865, as a seedling of Col. Wilder, which it closely resembles.

MONTCLAIR. [Red, *strigosus.*] A supposed seedling of the Philadelphia which originated by accident on the grounds of Messrs. E. & J. C. Williams, Montclair, N. J., and was discovered in 1872. It was figured in the *Rural New Yorker*, October 12, 1878, and introduced by Messrs. Williams to the public in the following year, being admitted to the Michigan fruit catalogue in that year, and into the catalogue of the American Pomological Society four years later. It never became popular, however, and was dropped from the Michigan catalogue in 1888. It is described as much like the Philadelphia in season, hardiness, plant and fruit, but an improvement in several respects upon that variety, being more vigorous, even more productive, fruit larger, of the same color and texture, being rather soft, more conical than that variety, finer grained, and of more sprightly, aromatic flavor, but not equal in quality to the foreign varieties. The canes are of a light red color with numerous slender, purplish spines at the base and sucker only moderately. The leaves are thick, roundish and crumpled.

MOTE'S EVERBEARING. [Purple Cap.] Recorded by Downing in 1869 as a new variety raised by L. S. Mote of West Milton, Ohio, and described as somewhat like the Catawissa; canes brownish, branching; spines sharp and slender; numerous at the base, but few above, fruit of medium size, roundish obtuse, dark red with a bloom; grains quite large, rather firm, juicy, sub-acid and separating freely from the core.

MRS. WOOD. [Purple Cap.] Described by Downing in 1869 as originated by Mrs. Ruben Wood, near Cleveland, Ohio, and supposed to be a cross between a black cap and a purple cane. Canes very strong, much branched and productive; fruit of medium size, roundish, obtuse, purplish red with a bloom, moderately firm, juicy, sprightly, sub-acid, separating freely from the core, ripening late. F. R. Elliott in 1883 considered it the best of the native red or hybrid varieties, and larger than any other hybrid sort. It is figured in the *Horticulturist*, 1867, p. 226.

MURIEL. On trial at the experimental farm at Agassiz, B. C.

MUSKINGUM. [Purple Cap.] (*Shaffer's Sister, Melott's Favorite.*) Originated in the orchard of Mrs. Simeon Ellis of Coshocton Co., central Ohio, near the Muskingum river, some fifteen years ago. It closely resembles the Shaffer, but the plants are smaller and more compact, and the fruit somewhat smaller but firmer. It was named and introduced by Mr. James Madison of Chili, Ohio. W. J. Green, of the Ohio experiment station writes that the variety on trial at that station in 1885 under the name of Shaffer's Sister, and afterwards named Melott's Favorite, proved to be the Muskingum. Mr. A. Melott, of Nashville, Ohio, distributed some of the plants in 1886, which account for one of the synonyms.

MYSTERY. [Black Cap.] Reported from the Minnesta experiment station in 1892, as an everbearing black cap from Kentucky, of medium size, firmness, quality and vigor, ripening late, not at all productive, and bearing in Minnesota no autumn crop.

NAOMI. [Red.] By many authorities this variety has been regarded as the Franconia. The Lost Rubies, Cuthbert, and Fastolff have also been recorded as its synonyms, so that much confusion exists in regard to it. Charles Dowing said in 1869 that it so closely resembled Franconia that he could see no difference, though it was said to be a seedling, more hardy, with smaller grains, etc. It was figured in the *Horticulturist* for September, 1866. F. R. Elliott of Cleveland, Ohio, stated in 1866 that he had observed it for about twelve years and that it originated in that county in the garden of Mrs. George Wood. He described it as hardy, productive, roundish or obtusely conical, with long hairs and large grains, bright red, firm, rich, sprightly; canes strong and branching, brown, smooth or having only a few small spines. This description certainly agrees very closely with that of the Franconia, but Mr. Elliott regards them as distinct though very similar, the Naomi being the more hardy.

NARRAGANSETT. [Red.] Originated by John F. Jolls of Providence, R. I. prior to 1870, who reported it as large, productive and a long keeper. It is described by T. T. Lyon as conical, bright scarlet, and of fine flavor.

NEMAHA. [Black Cap.] Originated by Ex-Gov. Robert W. Furnas of Brownville, Neb., and introduced by Green's Nursery Company of Rochester, N. Y., about ten years ago. It is supposed to be a seedling of the Gregg, which it much resembles in plant and fruit, being however more

hardy. It is not quite as large as that variety, possibly a little later, while it seems to be blacker and of a little better quality. As a market variety, it is rapidly coming into favor. It may be added that many of the plants originally sent out for Nemaha were spurious, leaving for a time some confusion in regard to this variety in the public mind. Since writing the above, Mr. Furnas has sent the following: "Somewhere near thirty years ago I found growing wild in the bluff land bordering on the west bank of the Missouri river, in Nemaha county, Nebraska, a bunch or small patch of black cap raspberries, fifty or more, where it had self propagated from tips as they grew for several years. The berries were then ripe. Both the plant and berry attracted my attention. The next spring I lifted a lot of the younger plants and transplanted them into my garden where I gave them care and attention, which increased the size of the berry and the vigor of the plant as well. Some years after I sent out a few of the plants to each of half a dozen prominent small fruit gowers in different parts of the Eastern states, to test. I have made no effort to push it into prominence. It seems to have told its own story."

NEWARK. On trial in 1892 at the Oklahoma experiment station.

NEW ROCHELLE. [Purple Cap.] A seedling, probably of the Catawissa, originated by S. P. Carpenter of New Rochelle, N. Y., and apparently introduced by E. W. Carpenter of Rye, that state. It closely resembles the Shaffer, but is less vigorous, earlier and smaller. As the plant propagates only from the tips it is supposed to be a hybrid. It is hardy against cold, but subject to injury in the south. The fruit ripens early and through a long season, is of good size, roundish conical, dull purple or brownish red, with a dense whitish gray bloom, a rich sub-acid flavor, rather juicy and soft. Varieties of this class are less seedy than the black caps. The New Rochelle, though quite extensively tested during the past few years, does not seem likely to become generally popular, the only favorable reports coming from Southern California.

NIAGARA. [Red.] A new variety on trial at several of the stations for the past few years which has many good qualities, being of good flavor and texture, and apparently vigorous and productive, but too dark in color.

NORTHFIELD. [Black Cap.] Sent out for trial a few years ago by M. T. Thompson, of Rio Vista, Va. The plant proved to be fairly vigorous, healthy and productive, but the fruit was too small to be of any special value, and it was never introduced. It is also spelled NORFIELD.

NORTH RIVER ANTWERP. See HUDSON RIVER ANTWERP.

NORTHUMBERLAND FILLBASKET. [Red, *Idæus.*] Described by Elliott in 1865 as a new foreign [English] variety, with vigorous canes, clothed with numerous, rather strong, crimson spines; fruit rather globular, or obtusely conical, deep red and of pleasant flavor. Mr. Fuller two years later called it a good market variety, but not superior to the Franconia or North River [Hudson River] Antwerp.

NORWALK. [Red, *Idæus.*] Introduced in 1879 by Mallory & Downs of South Norwalk, Ct., after having been grown by them for some years for market. Its fruit is said to closely resemble that of the Red Antwerp, but to be less downy.

NORWOOD. [Purple Cap.] (*Norwood's Prolific.*) From Mass. Admitted to the Michigan fruit catalogue in 1878, but rejected ten years later. Described by T. T. Lyon as of medium size, round, purplish and of

good quality. Thomas Meehan, of Philadelphia, described it in 1875, after fruiting it one season, as evidently a hybrid, rooting at the tips, but destitute of suckers; fruit similar in color to the Philadelphia; plant vigorous and not injured by the sun.

NOTTINGHAM SCARLET. [Red, *Idæus.*] An old English variety introduced before 1850 by Marshall P. Wilder, who considered it the richest in flavor of any of the older varieties. It was of medium size, red, obtusely conical and apparently productive.

OCTOBER RED. See FOUR SEASONS RED.

OCTOBER YELLOW. See FOUR SEASONS YELLOW.

OHIO. [Black Cap.] One of the very best market varieties, and now grown by the hundreds of acres in western New York and elsewhere for evaporating purposes, and for use in the fresh state. It is said on good authority to produce more pounds of dry material per bushel than any other variety, a fact attributed mainly to its seediness. Its canes are remarkably vigorous, hardy and productive, with few spines, and clothed with a thick white pubescence. The fruit ripens in mid season; size medium, firm and of good quality. There is complaint, however, of its turning an unattractive, reddish brown appearance in dry weather. This variety first attracted general attention some ten years ago, but it is evidently an old sort of obscure origin. A. M. Purdy in 1885 stated that it was the Old Miami, which it certainly closely resembles. He stated that a Mr. Van Dusen, of Palmyra, grew the variety twenty or twenty-five years ago, from whom at that time Mr. Purdy obtained plants which proved to be the same as the Miami obtained afterwards from Ohio. Mr. Van Dusen said he obtained his plants from Ohio and gave them the name "Ohio." Another account gives "Chapman" as the original name of the Ohio. For an account of this see that variety. For an explanation of the name "Alden," which occasionally appears as a synonym of Ohio, see that name. The name Ohio was also applied in 1844 in Wm. Kenrick's "New American Orchardist" to the variety since known as the Ohio Everbearing, so that Downing in 1845 gave Ohio as a synonym of that variety.

OHIO EVERBEARING. (*Ohio Everlasting, Ohio Monthly, Every Day.*?) This variety, though it has never been regarded as of any great value, seems to have been the first black cap named and introduced into cultivation. This fact appears to have been due to its habit of fruiting in autumn upon the current year's canes, as well as upon the older canes at the usual season. This peculiarity was long considered as rendering a raspberry of special value for the family garden, and existed in many of the red varieties grown at an early date. The same feature would naturally attract attention therefore if found in any of the wild varieties of the black raspberry. The Ohio Everbearing is said to have been in cultivation as far back as 1832, though under various names, and it is possible that prior to 1860 any autumnal bearing black cap may at times have been given this name. Downing stated in 1845 that it had then been cultivated for some time by a Quaker settlement in Ohio, and that it was made known to eastern growers by Nicholas Longworth, of Cincinnati, Ohio. J. A. Warder stated in 1861 that there were several sorts of this fruit and that the same plantation varied in its bearing habits in different years and that soil and treatment greatly affected the crop and its season of bearing. He had known them to give a fine crop in September and fail to show a

single summer blossom in the following year. He had also seen plantations on the other hand which produced no autumn fruit. He described it as large, gray-black and rather early.

OHIO MONTHLY. See Ohio Everbearing.

OLATHE. [Red, *strigosus.*] (*Stayman's No. 5.*) Originated by J. Stayman of Leavenworth, Kansas, from seed of the Reliance planted by him in 1884 being the only one of a large number of the resulting seedlings worth growing. It has been on trial at several of the experiment stations but is not yet introduced to the public. Mr. Stayman describes it as large, firm, hardy and productive, of bright red color and good quality, ripening later than the Crimson Beauty. S. A. Beach of the New York experiment station at Geneva says: "Canes rather slender, vigorous, upright, dark red, of the *strigosus* type; fruit large, firm, juicy, of good quality and color, ripening among the latest, and productive." Mr. C. E. Hunn while at the same station described the color of the fruit as "dark red," instead of "bright red," as given above by Mr. Stayman. This is a point upon which different observers frequently and very naturally make apparently conflicting statements, since the line is arbitrary and often difficult to draw.

OLDER. [Black Cap.] Mr. L. K. Ballard of Warren, Ill., writes: "The Older is a chance seedling which came up in the garden of a Mr. Older of Independence, Iowa, and was first noticed by him about 1872. He saw that it was valuable and propagated it, giving the plants freely to his friends and his neighbors. In 1876 a friend of his, a Mr. Burser of Warren, Iowa, obtained some of the plants. About this time Mr. Older died, without having advertised the plants for sale or having given it a name, and Mr. Burser thereupon named the new variety 'Older' in his honor. Mr. Burser was, however, not a fruit man and had only a small garden and gave away all the plants as fast as they multiplied. I saw the variety in bearing the first year it fruited in his garden and told him that if he would save me a dozen plants I would give him two dollars. He did so. At that time, 1880, I had no thought of introducing the variety but finally did so in 1882, and since then have been unable to supply the demand for the plants."

Its claimed superiority over other varieties consists in its hardiness, ability to withstand drouth, productiveness, large size, absence of bloom, and ability to remain long in good condition on the vines after ripening. The fruit is said to ripen with the Ohio, to be firm, and of excellent quality. The Pennsylvania experiment station reported in 1893: "Canes vigorous, light purple and thorny; fruit large, round, purple to black, quite soft, slightly acid, and in flavor cannot be considered excellent. Season late and short."

ONTARIO. [Black Cap.] Found in 1866 by Mr. E. E. Lord on his grounds near Fairport, Monroe county, N. Y., and by him introduced to the public in 1872. He claimed it to be vigorous and hardy, a week earlier than Doolittle, with a long season, productive, firm, large and sweet. Charles Downing considered it vigorous and productive, firmer than other sorts, and with more bloom. J. J. Thomas spoke of it as large grained, rather light in color for a black cap; or of a dark purplish brown and slightly hoary. T. T. Lyon describes it as medium to large with a thick bluish bloom, not very acid, and of excellent quality.

ORANGE. [Yellow, *Idæus.*] (*Brinckle's Orange.*) Originated by

Dr. W. D. Brinckle, of Philadelphia, a noted originator of improved varieties, and first president of the American Pomological Society. He obtained it from seed of the Dyack, planted July 13, 1843, which vegetated the following spring, and first fruited in 1845. It is still the standard of excellence as regards quality, and is planted as a family variety wherever it will thrive. It is very susceptible, both to heat and to cold, so that the area of its successful cultivation is quite limited, though apparently more extended than that of the Red Antwerp. It now bears commendatory stars for thirteen states and provinces in the catalogue of the American Pomological Society. A figure and description may be found in the report of the United States Department of Agriculture for 1866. The canes are of medium growth, light gray, with white prickles, leaf irregular, corrugated; fruit conical, bright orange (or of a beautiful buff color according to one description) and of exquisite flavor. Its season is rather early and short, though the yield is abundant. The fruit has the valuable peculiarity of adhering well to the stem after being fully ripe. Though remarkably handsome, it is not firm enough for market.

ORANGE CANADA. See ARNOLD'S ORANGE.

ORANGE KING. See ARNOLD'S ORANGE.

OREGON. [*Rubus leucodermis.*] Reported in 1877, by Henry Miller of Portland, Oregon, as a valuable variety for that state. A writer in *Purdy's Fruit Recorder,* in 1872, described the wild Oregon Black Cap as the poorest bearer and poorest in flavor of any variety he had tried. F. W. Miller of Portland, Oregon, writes: "The Oregon Black Cap raspberry referred to is native—grows wild over Oregon and Washington. It is not very good east of the Cascade mountains—too hot for it. In this valley (Willamette) it is considered one of the best of the raspberries. It is not as dry as other black caps; larger than Gregg."

OZARK. [Black Cap.] Originated a few years ago just west of Springfield, Mo., where it is said to be as good as the Hopkins.

OSCEOLA. [Red, *strigosus.*] Originated in Osceola county, in Northwestern Iowa, and reported by the late L. G. Ireland of Sibley, in 1881, as a rather soft and extremely hardy variety.

PALLUAU. See BELLE DE PALLUAU.

PALMER. [Black Cap.] (*Palmer's No. 1, Acme.*) Originated by F. R. Palmer of Mansfield, Ohio; fruited for the first time in 1882; first offered for sale in the fall of 1888. Mr. Palmer writes that after growing raspberry seedlings for twenty-five years this is the only one he considers worthy of introduction. It has been widely tested and reports have been so uniformly favorable, that it is now displacing in many localities the Souhegan and other early sorts. The choice between several varieties of its season is very close but appears to be in favor of the Palmer on the score of hardiness, productiveness and vigor. It is claimed to be larger and better than the Souhegan, but this may be doubted. As grown here, at Ann Arbor, the fruit is medium to small, round, firm, glossy, black and handsome. The canes are vigorous and upright, very spiny, especially towards the base, only moderately large, with the fruiting branches very small and slender. The fruit begins to ripen before the Souhegan and is entirely gone before the Gregg ripens. Mr. Palmer writes that he supposes this variety to be a cross between the Gregg and the Tyler. It was first grown by him as the No. 1, then sent for trial to the Indiana experiment station under the name

of "Acme," but was renamed "Palmer" before being offered to the public in 1888.

PARNELL. [Red.] The following discussion took place at the meeting of the American Pomological Society in 1881:

"Norman J. Colman: I suspect it to be an old variety that has been overlooked. It is perfectly hardy at St. Louis, Mo., and has large conical fruit which sells well.

"Geo. W. Trowbridge: It is a Cincinnati variety. I can endorse all the Colonel has said. It never winter-kills, but sometimes kills in spring, and needs protection. It is a beautiful berry of good flavor.

"E. P. Roe: I have wondered why it was not more popular.

"J. A. Warder: We consider it about the tenderest variety we have near Cincinnati."

T. T. Lyon wrote in 1883: "A new early variety, which has proved hardy at South Haven, Michigan, but the foliage burns before the fruit all ripens. It is said to be at least partly of *Idæus* parentage. It is vigorous and productive, fully of medium size, long, ovate conical, rather firm, bright red, turning dark when fully ripe, with a slight bloom, and with a peculiar, pleasant, rich, spicy flavor." A few years later it was reported by him as wanting in vigor.

PARRY NOS. 1 and 2. [Red.] These originated with the late Judge Wm. Parry of Parry, N. J., but were never considered by him worth naming and introducing. No. 1 is described as of rank growth, dark foliage, fairly productive, early, soft and of good flavor. No. 2 was later, less vigorous, but sometimes more productive, with a long season and large, firm fruit. It was regarded at the New York experiment station in 1891 as promising.

PATRICIAN. [Red, *Idæus.*] A temporary name applied by E. P. Roe in 1881 to a variety imported by Mr. Downing from France but the name of which had been lost. Mr. Roe described it as very showy and promising, but nothing further is known regarding it.

PATTERSON. [Red, *Idæus.*] (*General Patterson.*) A seedling of the Col. Wilder raised by Dr. Brinckle of Philadelphia and named in honor of Gen. Robert Patterson of Pennsylvania, in recognition of the interest taken by him in horticultural affairs. It is described as having vigorous canes clothed with red spines, and bearing large, round, crimson fruit.

PERFECTION. [Red.] Originated by F. W. Loudon of Janesville, Wis., and said to be a cross between the Cuthbert and the Turner. It is described as large, roundish, elongated, dark crimson, with a bloom, rather soft, tart and juicy, but pleasant.

PENNSYLVANIA. [Red, *strigosus.*] W. R. Prince states in his Pomological Manual (1832) that he obtained it from London under the name *Rubus pennsylvanicus*, but that he had since found it wild in the woods of Maine. It is described by him as dark red, of inferior flavor, but productive.

PEARL. [Red.] Described by Fuller in 1867 as a light red variety of good quality, dwarf and hardy, but not very productive. By some it has been considered a synonym of the Brandywine. This idea may have come from the fact that Thomas, in his "Fruit Culturist" (1885), gives Susqueco (a synonym of Brandywine), as the synonym of Pearl. He there states that the canes of the Pearl are low and dwarf like those of the

Brandywine, but that the foliage starts a week later. Wm. Parry, in 1870, described the Pearl as of medium size, a handsome bright red, firm, the canes dwarf and with thick leaves. He describes Susqueco as much like it, and perhaps a seedling of it, but more vigorous, the leaves starting a week earlier and the fruit larger and selling for double the price in the Philadelphia market.

PERPETUAL BEARING. See DOUBLE BEARING.

PHILADELPHIA. [Red, *strigosus.*] A writer in the *Magazine of Horticulture*, 1863, p. 460, describes it as a native variety found growing in a wood within the limits of the city of Philadelphia. In the following year a writer in the *Gardener's Monthly* stated that the variety had been about 26 years working itself into public notice and was likely to become the leading variety in cultivation. In the *American Agriculturist* for 1866, p. 323, this variety is figured and described. It is there stated that the original plant was found wild near Philadelphia some twenty odd years before. The writer regarded it as probably a marked variety of our common *strigosus*, which seems quite likely, though some have considered it an American seedling of European parentage, while many have supposed from the color of its fruit and the fewness of its suckers that it belonged to the hybrid or "purple cane" group. E. P. Roe found that it did not root as readily from the tips as other purple cane varieties. The above account also contains the statement that the variety was then very largely grown for market in New Jersey and not extensively elsewhere. Still, it is known that in Southwestern Michigan this variety and the Doolittle had become so extensively planted at that time as to overstock the Chicago market, resulting in a more restricted area being planted for a number of years thereafter. These two varieties were well adapted to be grown together for market, as the Philadelphia began to ripen just as the season of the Doolittle was nearly over. As early as 1882, a native red variety, possibly the one we are now considering, was in common cultivation in Delaware. The popularity which the Philadelphia so long enjoyed was due chiefly to its extreme hardiness. All of the true red varieties cultivated to any extent up to that time (for the Catawissa and Purple Cane can hardly be called red varieties) had belonged to the European species, *Rubus Idæus*, which was adapted to only a small part of this country. The Philadelphia proved adapted to a wide range of situations, both north and south, and although other native red varieties have been introduced since then which have proved still more hardy, none have done more to bring the red raspberry into general cultivation as a market crop. Wm. Saunders, of the United States Department of Agriculture at Washington, wrote in 1866 that, out of the sixteen varieties left uncovered the previous winter, the Philadelphia was the only one that produced a fair crop. It was reported at an early day as one of the few varieties that succeeded in Georgia. There have been good reports from all parts of the west, though in some localities it has been injured. Kansas City, Mo., has reported unfavorably. At Green Bay, Wisconsin, it has usually withstood the winters, but has sometimes been injured, and about once in ten years it is killed to the ground. Another Wisconsin point reports three full crops in five years and a partial crop the fourth season. In the severe climate of Central Ohio it is killed to the ground in hard winters. From Ontario it is generally reported as hardy and prolific In Connecticut it is often damaged. Its disappearance from cultivation for the past ten or fifteen years

has been due to the development of the Cuthbert and other hardy native varieties possessing larger size, better color and greater firmness, or other desirable features which the Philadelphia lacked.

The Philadelphia may be described as follows: Canes moderately vigorous, with few suckers, smooth and purple; leaves firm, adapted to sandy soil and hot weather; fruit of medium size, round, dull red or purple, with large grains, rather soft and of moderate quality; season medium; very productive.

PILATE. [Red, *Idæus.*] Recorded by Fuller in 1867 as a much extolled foreign variety, no better than many of our older sorts. Downing described it as a French sort, large, crimson, conical, with a slight bloom.

PIONEER. [Black Cap.] (*Progress.*) Originated on the farm of Jacob Muhl, of Hammonton, N. J., and apparently grown by him for market for some time before being offered to the public about 1889. In that year the J. T. Lovett Co. offered it under the name of "Progress," but the older name is preferred, though both names are often used together. The variety is much like the Souhegan, but later and more vigorous.

POMONA. [Red.] Introduced by Wm. Parry of the Pomona nursery, Parry, N. J., about 1887, but since then discarded by him. Said to be large, productive, of good quality, but soft. Recommended by some as the best early variety for home use. Mr. C. E. Hunn, of Geneva, N. Y., reported it in 1891 as larger than Cuthbert but less productive. Mr. S. A. Beach reported it two years later as exceeded in yield by the Cuthbert only, and considered a promising variety.

PRIDE OF KENT. [Red, *Idæus.*] Originated a short time ago by Mr. Fallstaff, of Kent, England; imported about 1887 by Mr. Henry King, of Jefferson county, Colorado, and introduced to public notice in 1892 by R. S. Edwards, of Highland, that state. Its canes are stout, often six or seven feet high, yellowish, covered with short prickles, leaves deep green, toned with red upon the margin, fruit firm, bright red and of excellent quality. Season long, continuing until frost; yield large. (Bailey's Annals of Horticulture, 1892.) The N. Y. experiment station at Geneva reports in 1893: Canes strong and vigorous, of the *Idæus* type, but not injured last winter, though the temperature fell to six degrees below zero; fruit large to very large, very soft and of delicious flavor.

PRIDE OF THE HUDSON. [Red, *Idæus.*] A chance seedling originating in the garden of T. H. Roe, Newburgh, N. Y., about 1872, and introduced to public notice by E. P. Roe, of Cornwall, who discovered it. The garden where it was found was an old one and contained many varieties of raspberries under cultivation. The new sort is described as vigorous, some of the canes reaching fourteen feet in height; spines few; leaves large, thick and deeply corrugated; fruit large, of fine appearance and excellent flavor, but too soft for market. Mr. J. T. Lovett states that in northern New Jersy it loses its leaves, as do all the Antwerp varieties there, which so enfeebles it that it winter kills to the ground. Reports from all other localities speak of it as tender. One writer states that it will not stand well in dry spots, and that it is quite freaky in every way. Mr. Roe quickly discontinued its sale.

PRIDE OF THE WEST. [Black Cap.] Reported by T. T. Lyon

in 1892 as having been grown by him for over three years, and found to be very large, grayish black, moderately vigorous and productive, and of fair quality.

PRIMUS. A hybrid of *Rubus ursinus* crossed with the Siberian raspberry, *Rubus crataegifolious.* Produced by Luther Burbank, of Santa Rosa, Cal., who says that it ripens there with the early strawberries, and in appearance and characteristics resembles the blackberries more than the raspberries. It has not yet been introduced. Now owned by John Lewis Childs, Floral Park, N. Y.

PRINCE'S GLOBOSE. [Red.] Originated by W. R. Prince, Flushing, N.Y., and described by Charles Downing in 1869 as having straight, upright, branching canes, clothed with numerous spines, which are long and stout; fruit large, nearly globular, or very obtusely conical; grains very large, dull red, with deep bloom, flesh coarse, rather dry and crumbly.

PRINCE OF WALES. [Red, *Idæus.*] An English variety described by Downing, in 1868, as having strong, nearly upright canes, with purplish spines; fruit large, conical, somewhat obtuse, grains small, rather compact, regular, quite hairy, crimson; flesh moderately firm, sweet and very good, separating freely from the core.

PROGRESS. See Pioneer.

PROLIFIC RED. [*Idæus.*] Described by W. R. Prince, in 1832, as dwarf, slender, with numerous small spines; fruit of good size and quality; usually a second crop in August.

PROSSER. See Burlington.

PURPLE CANE. [Purple Cap.] (*English Brown*, erroneously; *Cane Stock ?; American Red Cane*, of Charles Downing; *Red Cane*, of some; *Common Red*, in part. For additional synonyms see below.) The synonymy of this variety is quite confusing, and it is possible that I have not been entirely successful in reducing it. The name chosen is the one adopted by Dr. Warder, and appears to be the one by which the variety was best or most widely known. It is a name, however, somewhat liable to error from the fact that the prominence of this variety for a long time caused its name to be applied to the whole class of which it was a type (the same group or class of varieties which in our day are considered hybrids and often known as the "Shaffer group"). In 1861 Dr. J. A. Warder described this variety under the name Purple Cane, and said that it was known by Charles Downing as the Am. Red Cane. In 1869, however, Downing appears to have adopted the name Purple Cane. Dr. Warder said that its origin was unknown, but that it had been cultivated for half a century or more near New York, Philadelphia and elsewhere. He added that it used to be called English, a term formerly given to every kind of fruit that was good and not found wild. The name English Brown had also been applied to it by some. W. R. Prince, of Flushing, N. Y., wrote in 1847 that this variety was then extensively cultivated for market under the name Common Red, furnishing nineteen-twentieths of all the New York supply; it was different from the wild *strigosus.* He had seen this "Common Red" wild, however, in the Catskills. Its shoots resembled the black cap. It was called English Red in some catalogues, and was generally so called, he says, until he exposed the error some fifteen years before.

About 1819, Gen. John Armstrong, in a series of articles on agriculture, afterwards published in book form, stated that the raspberry which on the

whole was the best for the main crop was the cane stock. This I have regarded was probably the Purple Cane. The only other varieties mentioned by him are the Antwerps. In 1863, at a meeting of the American Institute, J. G. Bergen, of New Jersey, discussing the Red Cane, said it used to be largely grown there, but that it gave way to better market sorts. He added that it would not spread like some other kinds. Mr. J. A. Donaldson of St. Joseph, Michigan, in the same connection gives its description as follows: Fruit rather small, compared with the Antwerp, too soft for market, but for home use better than the Antwerp, Franconia or Fastolff; canes red, covered with bloom, rooting at the tips, hardy and productive.

Charles Downing, in 1869, wrote: "Purple cane (*Purple Prolific, Huntsville, English Purple, English Red, Red Prolifc, Allen*, erroneously). Native, spines rather long, stiff and moderately numerous; fruit of medium size, oblate, purplish maroon, with a slight bloom, soft, juicy and rich." In 1867 the Purple Cane had largely disappeared from the east, being displaced along the Hudson by the Hudson River Antwerp, and in New Jersey by the Philadelphia. It was still, however, considered the most popular variety in the west. Mr. Hathaway of Michigan, stated in 1871, that he regarded it as the best of the red varieties except the Philadelphia. It was a week earlier than that variety, but soft. The canes were fine, elastic and not easily broken, propagated by both suckers and tips. He considered the variety to be a hybrid between *occidentalis* and *strigosus*. In the same year W. C. Flagg of Illinois, stated that it was one of the best and hardiest varieties, but soft. J. J. Thomas recorded it in 1885 as rather small, dull red, soft, sweet and good; canes strong and recurved. E. P. Roe said: The old Purple Cane "almost took care of itself in our home garden for forty years or more, and its soft, small berries, would melt in one's mouth. Its canes were smooth, and its fruit of a dusky red color. In other respects it resembled the black cap."

PURPLE PROLIFIC. See PURPLE CAP.

QUEEN MARGUERITE. [Red.] On trial at the Michigan Agricultural College and elsewhere about 1885 and reported as a very good red variety.

QUEEN OF THE MARKET. See CUTHBERT.

QUEEN OF THE WEST. [Black Cap.] B. F. Smith of Lawrence, Kansas, writes: It is a Douglas county seedling and ripens a few days later thon the Kansas or the Souhegan. It is larger and more productive than the Souhegan or the Old Miami. Gregg is a little larger but not so sure a cropper. It will fruit on my grounds the first time this year. The man with whom it originated moved to Colorado some four or five years ago.

QUINBY'S FAVORITE. See CUTHBERT.

RANCOCAS. [Red.] Wm. H. Moon of Morrisville, Pa., introduced it to the public in 1884. It is large and somewhat later than the Hansell, but still early, as its large crop all ripens in a very short time. The canes are stout, branching, smooth and red. The fruit is borne at the ends of the branches where it is easily picked. It is large, soft, coarse grained, somewhat liable to crumble, and its dark purplish color renders it unattractive in market. Its musky flavor is also an objection with some.

Reports in regard to its vigor and productiveness are conflicting, but it does not seem destined to become popular. From a letter and circular just received from Mr. Moon it appears that the Rancocas originated as a chance seedling on the farm of Mr. J. S. Hansell in 1877, and received its name from the place of its origin on the Rancocas creek, near a town of the same name. See remarks under HANSELL.

RANSOM'S EVERBEARING. [Black Cap.] Sent out by Stark Bros., Louisiana, Mo., in 1890.

RED ANTWERP. [*Idæus.*] (*True Red Antwerp, Large Red Antwerp, Improved Antwerp, Old Red Antwerp,* of Elliott 1865; *New Red Antwerp,* of Downing, 1845; *Howland's Red Antwerp, Knevett's Antwerp, Burley, Framboisier á Gros Fruit* [Large Fruited Raspberry].) This old variety, which has been in cultivation for upwards of a century and probably longer, derived its name from Antwerp City, in Belgium, though the variety itself is said to have come from the island of Malta. Ever since its introduction it has been the best known variety in cultivation, both in Europe and in the United States, and the standard of excellence as to quality. From it have been derived many if not most of the varieties of its species found in our gardens. Its name has been so long and prominently before the public that it has not only accumulated a formidable array of synonyms but, what is more troublesome, many other sorts have been called by its name. In fact, for a long time in the early history of the cultivation of this fruit in the United States (up to about 1850) almost any red raspberry was likely to be called an Antwerp—even as now in many markets all cultivated blackberries are called "Lawtons." This was, notwithstanding the fact that although the Antwerp was everywhere upon the tongue and in the press it was never in this country anywhere extensively grown for market, except possibly for a short time, around New York and Boston.

In 1845, what appears from A. J. Downing's figure and description to have been the common wild red raspberry, had come to be almost universally known in the United States by the name of common Red Antwerp, and Downing found it necessary to carefully distinguish the two kinds, and style the proper variety the "new" or "true" Red Antwerp. Whether the small, poor berry was cultivated or not he does not state, though we may consider it entirely probable that it was, though it has come down to us with no other name than the one above given.

For a time the Hudson River Antwerp, so largely cultivated for the New York market, obscured somewhat the identity of the true variety. Its more conical form, and the smaller size and gray color of its canes, however, enable it to be readily distinguished.

The Red Antwerp may be described as follows: Canes tall, fairly vigorous, not inclined to branch, yellowish green, turning pale brown in autumn, with numerous strong, brown or reddish bristles below, but the upper parts, especially the fruiting branches, nearly smooth; leaves large and plaited; fruit large, with large grains; obtusely conical; dark red with a thick bloom; moderately firm, with a brisk vinous flavor. The variety is comparatively hardy for one of its class, though generally requiring winter protection to ensure a full crop. Its season is medium (early for a foreign sort) and it yields a large crop where it succeeds. An illustration of the Red Antwerp may be found in the report of the United States Department of Agriculture for 1866.

RED CANADA. See ARNOLD'S RED.

RED CANE. [Red, *Idœus.?*] A favorite market variety at one time in the vicinity of Hartford, Ct. It was introduced there without name but from the partial description given it seems to have been possibly the Red, or more probably the Hudson River, Antwerp. See also PURPLE CANE and ENGLISH RED CANE.

RED CLUSTER. Described by T. T. Lyon in 1893 as late, of medium size, red, roundish conical, of good quality and moderately productive. At the Michigan Agricultural College it is vigorous, moderately hardy, with large rugose leaves.

RED DOUBLE BEARING. See DOUBLE BEARING.

RED THORNLESS. See TURNER.

REEDER. [Red.] Originated about 1875 as a chance seedling in a plantation of other kinds by a Mr. Reeder near Stevensville, Berrien county, Mich., and disseminated by him and the late W. A. Brown. It appears never to have been grown, except for trial, outside of its original home, and although it evidently has some good points, it is no doubt permanently superseded. Mr. W. A. Smith of Benton Harbor writes: "Some twelve or fourteen years ago my friend Mr. W. A. Brown of Stevensville sent me some four or five hundred plants of the Reeder, recommending them highly. I set them out and gave them good care, but soon found that the fruit was utterly worthless, soft, dark colored, very downy, and poor in quality. Pickers refused to pick them, so I took them out and burned them up. They never have had any reputation and have never been cultivated. R. Morrill of the same place writes: "It did not give satisfaction here and has been discarded many years."

The following description is taken from the reports of T. T. Lyon: "Plant somewhat lacking in vigor; canes slender, green, or purplish green, bearing few slender spines; suckers sparingly; quite tender, being less hardy than the Cuthbert or the Gregg; fruit rather large, round, bright red (one report says 'rather dark, but not objectionably so') only moderately firm, with large, channeled pips; of good quality, being of a mild, rich subacid. Season medium, after the Hansell and before the Cuthbert. Productiveness rather low. Promising for home use and possibly for market.

RED PEARL. [Red, *strigosus.*] Recorded by Charles Downing in 1869, as of medium size, roundish conical, light red, moderately firm, scarcely good.

RED PROLIFIC. See Purple Cane.

RED QUEEN. [Red, *strigosus.*] Reported by J. S. Collins of Moorestown, N. J., in 1877 as a promising seedling of the Philadelphia.

RELIANCE. [Red, *strigosus.*] A descendant (said to be several generations removed) from the Philadelphia, originated by O. L. Felton of Merchantville, N. J., and apparently first exhibited at the Centennial Exposition at Philadelphia in 1876. It gained considerable popularity for a time and while it seems to have been an improvement upon the Philadelphia, in size at least, it was too much like that variety to compete with other sorts, so that it is now practically superseded. The following opinions may be given:

T. T. Lyon: "A slight improvement upon the Philadelphia, firmer and rather better. It is very hardy but rather small, of high flavor but dark color."

Ohio Experiment Station, 1888: "Although not new this variety is but little known, and not so well appreciated as it deserves. Its hardiness, productiveness and size of fruit place it among the foremost in point of profit as a market variety. The berries have the past season shown more tendency to crumble than formerly, which detracts greatly from their appearance in the basket."

Georgia Experiment Station, 1891: "Very hardy and productive."

Alabama Experiment Station, 1890: "Neither vigorous, prolific nor hardy; dies badly. Fruit very large, dark and soft."

General description: Plant vigorous and productive; fruit medium to large, roundish oblong, nearly globular, dark red, grains large, quite firm, sweet and sprightly but not of high flavor, separating freely from the core; season medium, ripening a little before the Cuthbert.

RILEYS' EARLY. Recorded as follows, by Charles Downing, in 1869: From N. J.; said to be of medium size, good flavor and quite early.

REX. [Black Cap.] Produced from a seed of the Gregg sown by the late John W. Perry, of Covington, Miami county, Ohio, in 1884 or 1885. His son, W. L. Perry, writes that he has two acres of it in bearing. In 1889 he sent plants for trial to the Ohio Experiment Station, where he says it failed to develop sufficient merit to be recommended in place of the Gregg. In his own locality, which is an unfavorable one for raspberries, he considers it as good as the Gregg, but destitute of sufficient special merit to warrant him in introducing it.

RIVERS' LARGE FRUITED MONTHLY. [Red, *Idæus.*] Imported from the Continent to England in 1847 by Thomas Rivers, and into the United States a few years later. Patrick Barry stated that he saw it in Mr. Rivers' nursery in 1848, and described it as a large red fruit, with rather slender canes, which in favorable seasons fruited from August to November. Mr. F. R. Elliott added in 1865 that the canes were thickly covered with dark purple spines, and that the fruit was only of medium size. Dr. Warder stated that it was unproductive in this country under ordinary treatment, and also tender, though that was immaterial in a perpetual raspberry which was expected to fruit chiefly on the current year's canes.

RIVERS' YELLOW. [Yellow, *Idæus.*] (*Large Orange.*) Originated apparently by Thomas Rivers, of England, and described by Charles Downing, 1869, as having strong, branching canes, clothed with few stout, greenish spines; fruit medium to large, roundish conical, pale reddish orange to deep orange; grains large, flesh soft, juicy, sub-acid but not rich, separating freely from the core. At the Michigan Agricultural College the plant is even more tender than that of the Yellow Antwerp, which it much resembles.

ROGERS' VICTORIA. See Victoria.

ROYAL CHURCH. [Red.] Charles A. Green, of Rochester, N. Y., who introduced this variety in 1893, writes that it originated nearly ten years ago as a chance seedling, near where Philadelphia, Herstine and other varieties had been growing, on the farm of Mr. Royal Church, of Harrisonville, Meigs county, Ohio. It may be described as follows: Canes vigorous, equal to the Cuthbert, clothed with numerous small, reddish prickles, generally hardy; foliage of the same reddish or purple color and finely corrugated; fruit ripens earlier than the Cuthbert, but has a long

season, rather large, roundish, dark crimson, moderately firm, with large grains and a large core which holds the berry well, of good quality, but somewhat disposed to crumble. Figured in the report of the United States Department of Agriculture for 1892. A few reports may be given:

Mr. Crawford, Ohio: "It is a good thing, but not very prolific."

Prof. L. R. Taft, Michigan: "Am well pleased with it. It is hardy to the tips, and more vigorous than Marlboro, if not than Cuthbert."

W. O. Aldrich, Ohio: "A little too dark in color, but lighter than the Philadelphia."

S. A. Beach, Geneva, N. Y., 1893: "Canes somewhat injured last winter, but productiveness this season second on the list, ranking next to the Cuthbert. Quality very good. Fruit ripened this season from July 11 to August 12, with good pickings from July 17 to August 3. We consider it worthy of trial for the home garden at least.

RUBY. [Red, *Idæus* x *strigosus.?*] One of the seedlings originated by D. W. Herstine, of Philadelphia from seed of the Allen grown near the Philadelphia, and named in 1870 by a visiting committee of the Pennsylvania Fruit Growers' Society. It is described as productive, large, dark crimson, sub-acid, and of excellent quality. See remarks under HERSTINE.

RUNDELL. [Black Cap.] A "yellow cap" closely resembling Beebe's Golden, originated by Chas. Rundell, of New Buffalo, Mich., who says: "I first saw it some time in July, 1888, while mowing weeds where, since 1876, I had a few Mammoth Cluster black caps growing. A few berries were on it when first seen." He is still cultivating the variety, and has sent it out for trial. It has met with small favor on account of its color.

RUSSELL'S RED. [*Idæus.?*] A seedling of the white Antwerp, fertilized, it is supposed, by the Red Cane of Hartford and vicinity, and fruited for several years prior to 1859, when it was exhibited by Dr. Russell at an exhibition at Hartford. It was said to be hardy and vigorous, with a long fruiting season, and flavor equal to any except the Antwerp, being a little brisker than that variety.

SAINT LOUIS. [Red.] Recorded by A. S. Fuller in 1867, on the authority of *Colman's Rural World*, as the best hardy raspberry yet tested in the vicinity of St. Louis, Mo., a free, vigorous grower and very productive, with large, sweet, bright red fruit. In 1866 Norman J. Colman reported it as an excellent variety, quite extensively grown about St. Louis, but likely to be superseded by the more vigorous Philadelphia.

SALZER'S EVERBEARING RED. [Hyb.] Origin Illinois. Introduced by the John A. Salzer Seed Co., Lacrosse, Wis., 1894, who state that it is a cross between Shaffer and Marlboro.

SARAH. [Purple Cap.] Originated by Prof. William Saunders, of London, Ont., from seed of the Shaffer, and described and figured by John Craig in the report of the experimental farms of Canada for 1893, p. 16. Said to be a moderate grower, suckering freely and propagating only that way; fruit large, round, drupes large, deep garnet, firm, very juicy, pleasantly acid and exceptionally rich. Its main crop does not ripen until after the Cuthbert.

SAUNDERS. [*Idæus* x *strigosus.?*] A large red variety of excellent flavor, originated by D. W. Herstine, of Philadelphia, from seed of the

Allen, fertilized, it is supposed, by the Philadelphia, which grew near. It was named in July, 1870, by a visiting committee from the Pennsylvania Fruit Growers' Society, in honor of Wm. Saunders, of the United States Department of Agriculture. It is described as ripening later than the Herstine, with less vigorous canes, darker colored and more globular fruit, and hardiness about the equal to that variety. See remarks under HERSTINE.

SAUNDERS' HYBRID. (*No. 53.?*) A hybrid between Philadelphia and Mammoth Cluster produced by Wm. Saunders, of London, Ont. It was sent out in 1880 by the Ontario Fruit Growers' Association. It is said to be very productive, large, dark red, and to propagate from the tips only.

SAUNDERS' NO. 60. A purplish black variety, extremely hardy, but of inferior quality, produced by Wm. Saunders, of London, Ontario.

SCARLET. Plants sent out under this name by Mr. Carpenter of New York, proved to be the two "Allen" varieties. (Chas. Downing, 1867.)

SCARLET GEM. [Red.] A seedling of the Crimson Beauty originated by Dr. J. Stayman of Leavenworth, Kansas, in 1876. He says it needs some other variety as a fertilizer in order to produce a full crop. Hale Bros., of Connecticut, considered it quite promising at one time and reported it in 1888 as vigorous and productive and four days earlier than any other variety. It has generally been discarded by the few who have tried it, apparently on account of its unproductiveness—doubtless owing to the defect above mentioned. It is described as firm, medium to large, round, bright red, but of low quality.

SEMPER FIDELIS. [Red, *Idæus.*] Recorded by Charles Downing in 1869 as an English variety with strong, upright canes covered with stiff, purplish spines; fruit large, conical, somewhat irregular, dull red with a thick bloom, grains of medium size, compact, flesh firm, not very juicy, good.

SENECA. [Black Cap.] Introduced to notice by Doolittle & Wright of Waterloo (near Seneca) N. Y., in 1867. It possessed some good qualities and has been grown to a considerable extent for market. Its season was a few days later than the Doolittle and the canes more vigorous, productive but very thorny. Its size was only medium; its quality firm and excellent but perhaps not superior to the Doolittle, and its color rather too dull. It was added for trial to the catalogue of the American Pomological Society about 1879 but was dropped in 1883.

SHAFFER. [Purple Cap.] (*Shaffer's Colossal.*) A chance seedling, an isolated plant of which was found fruiting in the garden of a man by the name of Geo. Shaffer two miles north of Scotsville, Monroe county, N. Y., by Chas. A. Green, the nurseryman, in 1878. The plant was then about nine years old; no other raspberry was growing near except black caps. Its remarkable vigor and productiveness, and the large size of its fruit, which was the largest he had ever seen, induced Mr. Green to propagate and offer it for sale. It at once became very popular as a market and family variety, being considered especially valuable for canning and fine for drying also. It may be described as follows: Canes of the largest size, upright, sparingly branched, with a deep purple bloom, clothed with rather numerous, stout prickles, destitute of suckers, rooting readily at the

tips, when artificially layered, but rarely otherwise; generally hardy, very productive, season medium, fruit of the largest size, round, purplish, turning to dark brown when fully ripe, pubescent, quite soft, flavor quite acid, and considered superior by many. The following testimony may be given:

Ohio Experiment Station, 1885: "It seems to do well everywhere and examples are numerous where the fruit has been sold for higher prices when customers became aware of its excellence."

Indiana Experiment Station, 1885: "This is by far the largest raspberry, both in cane and fruit that we have ever seen; not as hardy as some, but a great bearer of most too dark colored, rather acid, not very firm fruit. Ripens soon after the Gregg."

Chas. W. Garfield, Grand Rapids, Mich.: "It is a great success on my sandy and gravelly soil, but not much esteemed on the clay hills a few miles distant."

Prof. L. R. Taft, Michigan Agricultural College: "Always winter kills some, but bears well."

A. A. Crozier, Ann Arbor, Mich.: "Needs good care or it is less productive than black caps. Not popular in market."

John Wragg, Waukee, Iowa: "Shaffer is the best raspberry we have."

Missouri Hort. Report, 1890: "Kills nearly every winter in Northern Missouri but very popular in some parts of the state."

Virginia Experiment Station, 1892: "Always winter kills, but bears well on the new shoots from the base of the cane."

North Carolina Experiment Station, 1893: "The most hardy variety we have."

Wellington Boulter, Picton, Ont.: "The Shaffer is not good for canning at the factory; it goes all to pieces like the Cuthbert and requires too much sugar."

SHAFFER'S COLOSSAL. See SHAFFER.

SHAFFER'S SISTER. See MUSKINGUM.

SHARPE. On trial at the experimental farm at Agassiz, B. C.

SHORT JOINTED CANE. [Red, *strigosus*.] Recorded by W. R. Prince, in 1832 (Pom. Man., pt. II., p. 168).

SIBERIAN. See DOUBLE BEARING.

SILVER QUEEN. [Yellow, *Idæus*.] Placed on trial at the New York experiment station and elsewhere in 1885 by R. Johnson of Shortsville, N. Y., by whom it was named, and who obtained it from L. M. Macomber, of North Ferrisburgh, Vt., under the name "Silver Skin." He now writes that its cultivation has been given up as it proved unproductive, though of beautiful color and flavor. In 1893 S. A. Beach of the above station reported it as rather tender; fruit of a clear, pale yellow, medium to large, very soft, juicy, nearly sweet, of delicate flavor, very good to best.

SINTON'S THORNLESS. [Black Cap.] Recorded by Fuller in 1867 as similar to Doolittle, but a week earlier.

SIR JOHN. On trial at the experimental farm at Agassiz, B. C.

SKOWHEGAN. Charles Downing's spelling of SOUHEGAN, which see. Through some apparent oversight Mr. Downing used the name of a village in Maine instead of that of the river in New Hampshire, near which it originated, by which to designate this variety.

SMITH'S GIANT. [Black Cap.] A. M. Smith of St. Catharines,

Ont., writes: "It is a seedling, either of the Gregg or of Shaffer's Colossal. I sowed seeds of both, but am not sure which one it is from. Grown in 1888. I have tested it four or five years and think it superior to the Gregg in hardiness, fully equal in quality and productiveness. I have not yet disseminated it much, only sending it out to a few places for trial."

SMITH'S IRONCLAD. [Black Cap.] B. F. Smith of Lawrence, Kansas, writes: "Smith's Ironclad came into notice here some twenty years ago. A gardener, now dead, by the name of Smith, bought a bill of trees and other things from an agent and among the roots of the trees he found a single raspberry plant which he planted and increased until he accumulated a considerable stock from which he sold to his neighbors. It proved to be as hardy, or more so, than the Doolittle, and they called it Smith's Ironclad. It was never introduced as new fruits are now. In fact, I do not think it was a new sort as I am not able to note any difference between it and the 'Old Miami.'"

It is still cultivated in Kansas, but is losing popularity. It appears in the catalogue of the American Pomological Society under the name of "Smith," starred for Kansas and Nebraska. In the Kansas fruit list for 1889 the name appears under the three forms of "Ironclad," "Smith," and "Smith's Ironclad."

SMITH'S NO. 2. [Black Cap.] B. F. Smith of Lawrence, Kansas, writes: "They have a very promising seedling black cap at the Geneva experiment station that I sent them for trial five years ago. Through the carelessness of some laborers I lost the stock of it entirely. A neighbor of mine was back at New York last year and saw it growing at the station and says it is a fine variety. I found it growing as a chance seedling under an apple tree."

A report from the above station in 1893 stated that only one plant of this variety remained. The fruit was of medium size, firm, juicy, sweet and good.

SMITH'S PROLIFIC. [Black Cap.] Originated about ten years ago as a chance seedling in a strawberry patch on the grounds of Ezra G. Smith, of Manchester, New York. It was introduced by him in 1890, after a promising trial at the Geneva experiment station, and at once gained quite a favorable reputation among eastern growers, being distinguished for vigor, productiveness and other good qualities. Recently, however, it has not done so well. Mr. Smith writes that for the last two years it has not made the growth that it formerly did. A report from the Geneva station in 1893, states that in the previous winter the canes were damaged at least thirty per cent by the cold, while other black raspberries in the same patch remained uninjured. In 1891 it ranked second in productiveness among the black cap varieties on trial, while in 1893 it had dropped to the thirteenth.

The Pennsylvania experiment station reported in 1893: Canes stout, clusters large, berries of medium size, drupes small, black, sweet and good.

SMITHS' PURPLE. [Purple Cap.] Originated by B. F. Smith of Lawrence, Kansas, who sent it for trial to the experiment station at Geneva, New York in 1891, from which station Prof. S. A. Beech reported that it had all the characteristics of the black cap except the color of its fruit. This was of medium size, good quality, and had the black raspberry flavor.

SOUCHETTI. [White, *Idœus.*] (*White Transparent.*) Originated by Mr. Souchett, a nurseryman near Paris, about 1865, and imported from him by Marshall P. Wilder of Boston, Mass., with whom it was a favorite, and who distributed many plants. Robt. Manning of Boston, considers it the best of its class, being more productive than White Antwerp and of very good quality, but too soft for market. It is said to be less hardy than Brinckle's Orange. It is described by Charles Downing as having vigorous canes, clothed with scattering, slender, greenish spines; fruit rather large, conical, somewhat elongated, grains of medium size, compact, pale creamy yellow; flesh rather soft, moderately juicy, mild and sweet but not rich; separating freely from the core.

SOUHEGAN. [Black Cap.] Introduced by the Hale Bros., of South Glastonbury, Ct., in 1881, in which year Mr. J. H. Hale wrote as follows: "Souhegan is the proper spelling, derived from a small river of that name near which the variety originated [the Souhegan drains the southern part of Hillsboro County, N. H.] It originated in 1871 from seed of the Doolittle by Mr. J. A. Carleton of Hillsboro county, N. H. Three years ago Mr. Carleton wrote us that he had a new raspberry that would produce four times as much as any other variety, and offered to pay our expenses to New Hampshire if not found as represented. We therefore went, purchased the stock, and now have about an acre in cultivation."

Mr. Carleton, writing from North Lyndeborough, Hillsboro county, February 6, 1894, says: "The Souhegan is a seedling from a variety sent from Ellwanger & Barry sometime in the fifties. In 1869 my wife found a few seedlings from the old plant which I transplanted, and when they came into bearing they were a surprise to all who saw them. From one plant, with two canes, I obtained fifty new plants the year it was set, and the next season picked ten quarts of berries from the two canes."

The increase in popularity of the Souhegan was rapid from the start. The Gregg had been introduced as a market berry only a few years before, leaving an important place to be filled by an early variety, which was quickly occupied by the Souhegan, which thus displaced the old and unreliable Davison. Until now the Souhegan has remained on the whole the leading early variety, though its place is being disputed by nearly a score of other sorts very similar in season and character, some of which have already superseded it in certain localities. Among these may be mentioned the Palmer and Tyler. The latter so closely resembles the Souhegan that it is often sold for that variety, and is sometimes considered a synonym of it. It had, however, a separate origin.

The season of the Souhegan is about three days in advance of the Doolittle, varying somewhat according to circumstances, and it matures its whole crop in a comparatively short time, a desirable feature when later and larger varieties are coming on. The canes of the Souhegan are fairly vigorous, and the fruit of good size and color for market. It has proved to be of sufficient hardiness for most localities, being more hardy than the Gregg and some other kinds, but surpassed in this particular by the old Doolittle and the Ohio, and by some of the newer western sorts.

SOUTHERN SEEDLING. See TURNER.

SOUTHERN THORNLESS. See TURNER.

SPANISH BLACK. [Black Cap.] Grown and sold by Henry Geisler of Waltervliet, Michigan, who says that it is popular in his vicinity

and a week earlier than other varieties. It is reported that this is the Gregg renamed.

SPRY'S EARLY. [Black Cap.] A chance seedling found and brought into cultivation by John Spry of Ft. Atkinson, Wis., about 1884, and sent out by Coe & Converse of the same place in 1888. They report that it still does well with them. S. A. Beach of the New York experiment station at Geneva, described it in 1893 as a vigorous variety, with fruit of medium size, good black color, firm, juicy, nearly sweet, of very good flavor and quality.

SPRINGFIELD. [Black Cap.] A chance seedling originating about 1880 on the grounds of J. W. Adams and Co., of Springfield, Mass. After about two dozen plants were produced from the original hill the variety was considered worthless and the plants were all given to Mr. Chandler living a few miles distant. He soon increased the stock to an eighth of an acre, when it appeared so promising that Adams and Co. arranged to offer the variety for sale. Hale Bros. of So. Glastonbury, Ct., soon purchased some of the plants.

Mr. J. W. Adams writes that the variety does remarkably well with him, being quite hardy, healthy, vigorous and very productive, though not equaling the Tyler. Its canes are thornless and the quality of the fruit excellent. From outside of New England have come but few favorable reports. The canes are slender and somewhat lacking in vigor, requiring good treatment in order to be productive. Its season, and in fact its other characters, are very much like those of the Davison and like that variety it is passing out of cultivation.

STAYMAN'S NO. 1. [Purple Cap.] A seedling of Shaffer originated by Dr. J. Stayman of Leavenworth, Kansas, in 1884 and sent for trial to the editor of the *American Farmer and Horticulturist*, Rio Vista, Va., who, after one year's trial, states that it is the most beautiful large berry he ever saw, resembling the Marlboro, but later. Mr. Stayman adds that it is firm and of good quality, and propagates from the tips.

STAYMAN'S NO. 5. See OLATHE.

STŒVER. [Red, *strigosus.*] (*American Red.*) The typical wild red raspberry. Downing in 1869 records American Red (with the synonym Stœver) as the common red raspberry of the middle states, a week earlier than the Antweps, inferior in size and flavor, and having narrow leaves. In the *Michigan Farmer* for 1860 mention is made of Stœver as a new variety discovered in Vermont and taken to Philadelphia. It is described as of a rich crimson color and apparently hardy. There is no evidence at hand however to show that it was anything more than the wild species.

SUMMIT. [Black Cap.] Charles Downing records it in 1869 as an American yellow cap, raised by O. T. Hobbs of Randolph, Pa. Canes strong and branching, spines stout and numerous; fruit large for its class, roundish oblate, orange, with pink at the base of most of the grains, which are rather small and compact, firmer in texture and richer in flavor than the ordinary yellow cap.

SUPERB. [Red, *strigosus.*] (*Churchman's Superb.*) Originated by John Churchman, of Burlington, N. J., and supposed by him to be a seedling of Philadelphia. Introduced to notice in 1883 at the same time as the Hansell, with which it begins to ripen, though it has a much longer sea-

son. The berry is much larger than that variety, often fully seven-eighths of an inch in diameter, according to Mr. T. T. Lyon, who adds that it is high flavored, like most other *strigosus* varieties, but with the pips or grains so loosely put together that it is difficult to pick the berries without their crumbling. It is also too dark in color, he says, to suit the popular taste. It is generally recorded as hardy, though tender in the west, and liable to die back in the south. It appears to be productive in most localities, but it lacks vigor, and suckers sparingly, though more, according to J. J. Thomas, than the Montclair, which it resembles. It is figured in the *Gardener's Monthly*, 1881, page 256. At Geneva, N. Y., it has not been productive.

SUPERLATIVE. [Red, *Idæus.*] Introduced in 1892 by Ellwanger & Barry, of Rochester, N. Y., who obtained it from England. Fruit large and handsome, but crumbly. It is figured in *Orchard and Garden*, 1892, page 81.

SURPRISE. [Black Cap.] Found wild and introduced by George Husman, of Bluffton, Mo., about 1865, and described as having stiff, upright canes with few, stout spines; fruit large, with deep bloom, few seeds, and more conical than any other black cap. Season medium to late. See ELSIE.

SURPRISE. [Red.] T. T. Lyon wrote, in 1885: "Surprise comes to us without a history, and during a two years' trial has developed some useful qualities. Plant vigorous and productive; fruit large to very large, roundish, slightly conical, dark red with a slight bloom; texture rather soft; flavor sprightly, pleasant acid; rather dark in color, but promising even for market." Four years later, upon further trial, he adds that the season is late, plant tender and fruit crumbly and of low quality. The variety is said to be a chance seedling of the Franconia, originating in Montgomery county, N. Y., prior to 1881. F. R. Elliott considered it in 1883 of no special value.

SURPRISE D'AUTOMNE. [White, *Idæus.*] An everbearing foreign sort of fine flavor, reported by M. B. Bateman, of Painesville, Ohio. (*Country Gentleman*, 1873, p. 182).

SURREY. [Black Cap.] Introduced and controlled by the Cleveland Nursery Co., formerly of Ohio, now of Rio Vista, Va. The Virginia experiment station reported in 1892 that the variety was vigorous and promising; fruit with a light bloom, larger than any other kind on trial. The Michigan experiment station reported in the same year that the plants were somewhat lacking in vigor, and unproductive. Season, second early; fruit firm, of medium size, somewhat resembling the Gregg in form and color.

SUSQUECO. See BRANDYWINE.

SWEET HOME. [Black Cap.] A seedling of Lum's Everbearing, originated in Illinois and introduced about 1880. Mr. Tyler McWhorter, of Aledo, Ill., considered it better than the Mammoth Cluster, being larger, firmer and more stocky. Others find it of medium size and lacking in vigor and productiveness. Reports as to season are conflicting.

SWEET YELLOW ANTWERP. [Yellow, *Idæus.*] Recorded by Charles Downing in 1869 as an old English variety with slender canes, light yellow fruit of medium size, obtusely conical, with small grains, soft and juicy.

TALCOTT. [Red.] Sent out for trial by Hale Bros., of South Glastonbury, Ct., in 1883, and stated in the Michigan reports to be in every way like the Turner, except in form, which was ovate instead of roundish conical. It seemed, however, an improvement in productiveness. Plants lacking in vigor, fruit small and very early.

TALL RED CANE. [Red, *strigosus.*] Canes with numerous fine prickles; productive; fruit round, dropping too easily when ripe. (W. R. Prince, Pom. Man., pt. II, 1832, p. 168.)

THOMAS. [Black Cap.] (*Thomas' Seedling.*) On trial at the Indiana experiment station in 1886. Originated by S. Thomas, of Marion, Ind., and but little known.

THOMPSON'S EARLY PRIDE. [Red.] Sent out in 1888 by the Cleveland Nursery Co. of East Rockport, Ohio (now of Rio Vista, Va). The New York experiment station at Geneva reports: "Canes upright, vigorous, of the *strigosus* type.. This season (1893), it ripened sixteen per cent of its crop prior to July 13, being exceded in this respect by but three varieties on the list. Fruit of medium size, firm and moderately juicy, good in flavor and quality. Canes upright, bristly, vigorous and hardy. This season it was unproductive, ranking 23d as to yield. It ranked fifth in 1891, and was called productive in 1889.

E. S. Goff, of the Wisconsin experiment station, reported in 1891, that, as compared with Thompson's Early Prolific, it had more numerous short prickles, and was less vigorous and productive. A report from the Alabama station in 1890 called it hardy, vigorous and promising, about like Thompson's Early Prolific. The Hatch experiment station, of Mass., reported in the same year its standing as follows, perfection being one: "Productiveness 5, quality 7, earliness 2, size 5, per cent of winter killing 6."

THOMPSON'S EARLY PROLIFIC. [Red.] A chance seedling sent out in 1888 by the Cleveland Nursery Company, of East Rockport, Ohio (now of Rio Vista, Va.). S. A. Beach, of the N. Y. experiment station, at Geneva, reports as follows: "Canes of the *strigosus* type, somewhat slender, nearly free from prickles, bright dark red, upright, vigorous; fruit paler than in Early Pride, more juicy, of medium size, firm and of good quality. This season, 1893, while other varieties ripened from 13 to 40 per cent of their crop prior to July 13, this ripened but five per cent, and 29 per cent after the 24th, being therefore classed for this season with the late varieties. In yield it ranked 19th. The canes were injured by the past winter about as much as those of the Shaffer."

The Ohio experiment station reported in 1891: "Moderately productive, not vigorous, fruit of medium size, bright crimson and quite firm. Commences to ripen soon after the middle of the strawberry season, and gives good picking from the start. Altogether it was the most satisfactory red sort that has been tested here." W. O. Aldrich, of Columbus, Ohio, reported about the same time that it was hardy, fairly vigorous and productive, but no earlier than the Turner. John Craig, of the Central experimental farm, Ottawa, Canada, reported in 1892 that its earliness seemed to be its principal good point. It was hardy but not productive; fruit of medium size, round, bright red, and attractive. E. P. Powell, of Clinton, N. Y., reports it the first to ripen, but small. T. T. Lyon, of Michigan, reported it in 1893 as a good early variety.

THOMPSON'S KING. [Red.] (*Early King.*) Sent out by the Cleveland Nursery Company of Rio Vista, Va., in 1892, and described as

follows by H. E. Vandeman in U. S. Agricultural Report for that year, page 265: Medium in size, round, light crimson, drupes large, few, suture plainly marked, moderately firm, juicy, sub-acid and good. A seedling of Thompson [probably Thompson's Early Prolific], ripening about the same time but larger and more productive.

THUNDERER. [Red, *Idœus.*] F. R. Elliot recorded this in his Western Fruit Book in 1865 as a new variety lately introduced from England resembling the Franconia.

THWACK. [Red.] Introduced by Prof. Watson Foster of Louisiana, Mo., who said in 1877: "The plants were furnished me by Mr. T. S. Wilson who lived about ten miles from Brandon, N. Y. He was a student of mine twenty-five years ago at Dixon, Ill. His statement was that this new sort was a cross between the Herstine and Brandywine. The fruit resembles in shape the Brandywine, but is firmer, while its size averages larger than either of its parents. It is less acid than the Herstine but hardly as sweet as Brandywine. It resembles the Herstine in its stocky canes, which however are without thorns. The leaf is more crumpled than that of the Brandywine, but less so than that of Herstine. Its hardiness has not been excelled. I think it was in the winter of 1873 that Thwack, Herstine and Brandywine all stood unprotected upon the same northern exposure. The Thwack came out uninjured, while the others were killed to the ground. Its fruiting season is longer than that of any other variety and its yield very large, being three times that of Mammoth Cluster on my grounds."

Mr. N. Ohmer of Dayton, Ohio, visited Prof. Foster's grounds about the time of its introduction, saw the original patch and purchased a quantity of the plants. He asked Prof. Foster why he had given the variety such an odd name. He said because it "knocked them all," meaning that it was the best variety all things considered then known. Mr. Ohmer regarded it as of rather poor quality, but an excellent market sort, being large, productive, light red and very firm. It suckers profusely. Frank Ford & Son of Ohio consider it the best early market variety except the Winant. It was dropped from the Michigan fruit catalogue in 1888, but is still popular farther west.

TRUSTY. On trial at the experimental farm at Agassiz, B. C.

TURNER. [Red.] (*Red Thornless, Southern Thornless, Southern Seedling, Baldwin's Choice.*) Originated about sixty years ago, by Professor J. B. Turner of Jacksonville, Ill., and generally said to have been discovered growing wild or to have been originated by him from the wild species. It has the appearance of being a native variety and is generally so considered, but Professor Turner states in a letter published in E. P. Roe's book on Small Fruits, that no wild red raspberries were known to grow anywhere near his place, where this originated. He said he obtained from the east some plants called the Red Antwerp, which proved tender and which he attempted to improve in hardiness by raising seedlings. A large number of seedlings were grown, but as they appeared to be of no value they were neglected. Among them there finally appeared this one, which seemed valuable and was propagated, and afterwards became known as the Turner. At a meeting of the American Pomological Society in 1881, E. P. Roe said he had seen fruiting in Georgia, under the name "Southern Thornless," a variety which seemed to be the same as the Turner. Norman J. Colman said, at the same time: "I procured this berry under the name 'Southern Thornless' or 'Southern Seedling,' and cultivated it two or three years

before I got the Turner, which proved to be the same. I think it was first known as the 'Southern Seedling,' and got its present name from Professor Turner of Jacksonville, Illinois, who first called attention to its merits." J. T. Lovett added that the Turner was the same as Baldwin's Choice, which he obtained, he thought, from Ohio. George W. Trowbridge of Ohio said: "A. J. Markey, living near Cincinnati, had been supplying that market for several years with a very choice quality of red raspberries, the name of which he had concealed. A committee from the Cincinnati Horticultural Society visited his plantation and immediately recognized the variety as the Turner. He then stated that he obtained the plants from Illinois, under the name Baldwin's Choice. This name seems to have originated with Isaac Baldwin of Jacksonville, Illinois, who is known to have sold Turner plants.

The Turner became widely popular and was perhaps the leading red variety during the ten years following its admission to the catalogue of the American Pomological Society in 1877. Since then the Cuthbert and other well known varieties have become known and its usefulness has become restricted. Its chief merit is its hardiness, in which respect it is probably not surpassed by any other variety in cultivation. It is adapted to the extreme north as well as to the extreme south, as a few quotations will show:

J. T. Lovett, N. J., 1892: "The hardiest of all early varieties and immensely productive; fruit large, of bright crimson color and honied sweetness, but soft. It suckers immoderately."

E. P. Roe, N. Y., 1881: "The most vigorous of twenty-five varieties, except the Cuthbert."

J. H. Hale, Ct., 1880: "Productive, of good color, rich and sweet, but not as firm as the Brandywine; never winter kills."

T. T. Lyon, Michigan, 1889: "On strong, rich soil, and especially where superior hardiness is requisite, it may fairly be accorded the leading position among the varieties of its class."

Ohio Experiment Station, 1885: "Turner grown in hedgerows is small, soft and almost worthless for market. The best plan is hill culture, setting the plants five feet each way, and allowing only three to four canes to the hill. This method insures good crops, while the fruit is much improved in size and firmness."

In 1888 the same station reports: "Among the red varieties the Turner is still the standard for earliness and productiveness. It may not show the first ripe berries, but it will yield a good picking at an earlier date than any other red sort so far tested, with the possible exception of the Highland Hardy. If the bushes are closely pruned in the spring the fruit is sufficiently firm for a near market. Gives great profit than any other variety. Blights lately."

Indiana Experiment Station, 1885: "A hardy, strong, healthy grower, ripening early, berry of medium size, good flavor but not firm. First class for home use."

Experiment Farm, Brandon, Manitoba, 1892: "Turner is the hardiest of all. It is not benefited by winter protection."

John Saul, Washington, D. C., about 1880: "Turner is a strong grower and a profuse bearer, with a long season, hardy, and the most valuable of all, though the Cuthbert does well."

Alabama Experiment Station, 1890: "Turner is the most hardy and

reliable out of more than thirty varieties tested during the last five years. It is vigorous and prolific and is never injured by the sun or cold. Too many suckers is its only fault. Fruit purplish red, of medium size." The following year it is added that it remains in bearing from three to five weeks, and is perfectly satisfactory. Cuthbert was less prolific but nearly as good.

TWICE BEARING. [Red.] A. J. Downing wrote, in 1845: "The 'Twice Bearing,' known in some American gardens, is distinct from the Double Bearing, and is a small, inferior fruit which bears sparingly."

TYLER. [Black Cap.] Originated with Nathan Tyler, of Auburn, N. Y. Mr. J. E. Burr, of that place, writing in the *Indiana Farmer* about twelve years ago, said: "Among all the new candidates for public favor this raspberry is, I think, one of the most valuable that has yet been introduced. It has been quietly planted and grown here for a number of years past. One fruit grower has several acres of it in bearing, claiming that it is by far the most profitable sort he can raise, and several others have planted it almost exclusively for the past year or two. In the Auburn market it commands an average of three cents per quart more than the other varieties on account of its quality and handsome appearance. I think it is by far the best berry of its season, and effectually displaces the Davison and the Doolittle. It is a strong, vigorous plant and enormously productive, being as large as the McCormick and of a handsome jet black, there being scarcely a trace of bloom on it, while the seeds are small and few in number. Though exceedingly firm the berry is not dry or hard but juicy and of fine quality.

Since its introduction, the Tyler has shared a place with the Souhegan as an early market variety. The latter, however, though introduced at nearly the same time, has had much the larger share of public attention, doubtlessly owing to the more systematic and thorough way in which it was brought into notice. The two varieties have been considered by many to be identical and have been sometimes sold under the same name. The Tyler, however, appears to be a little the later and the more vigorous.

VERMONT. [Yellow, *Idæus.*] A seedling of the Champlain, said to be vigorous and hardy. Originated by L. M. Macomber of North Ferrisburgh, Vt. S. A. Beach of the Geneva, N. Y., experiment station, says that it resembles the *Idæus* in its canes, foliage, and numerous prickles, and is a delicious amateur fruit, of beautiful pale yellow, dusted with white down, of large size, productive, very soft, pulpy, juicy and of the best quality.

VICE PRESIDENT COPE. See COPE.

VICE PRESIDENT FRENCH. See FRENCH.

VICTORIA. [Red, *Idæus.*] (*Roger's Victoria.*) Recorded by A. J. Downing in 1845, as a new English seedling of high repute, said to resemble and fully equal the Red Antwerp, and in addition to be everbearing, fruiting from July to December, on its long side branches. Charles Downing added in 1869 that it was rather dwarf and delicate, fruit rather large, dark red and good. At the New York experiment station, at Geneva, in 1884, it ripened with the Brandywine, Fastolff and Fontenoy, bearing for 33 days, giving a good yield. In bulletin 21 of the Hatch experiment station, (Mass.) Samuel T. Maynard apparently refers to this variety under the name "Victor," and says it was the tenderest of twelve varieties on trial

and the lowest in yield; season medium, ripening with Brandywine; fruit firm but of poor quality. CORNELL'S VICTORIA, another English variety, is not known in the United States.

VIRGINIA. [Black Cap.] The Cleveland Nursery Company, formerly of Ohio, now of Rio Vista, Va., who control this variety, have not yet offered it for sale. The following report is from T. T. Lyon, to whom it was sent for trial: "Fruit large, jet black, round, conical, moderately firm, and of excellent quality. Holds out well at the end of the season."

VIRGINIA. [Red, *strigosus.*] (W. R. Prince, Pom. Man., pt. II, 1832, p. 167.)

WADE. [Black Cap.] John Wade of Veedersburg, Fountain county, Ind., the originator of this variety, writes as follows: "This variety is one of sixteen plants found in the spring of 1884, under a grape trellis, where the birds had dropped the seed the summer before. After transplanting the small plants and giving them cultivation for two years one out of the sixteen proved to be superior in yield and hardiness to any variety that I had as yet seen. I then began to propagate from this one, and from 300 hills the third year from planting I obtained 242 gallons. The berries are about the size of the McCormick, of fine flavor, only about three days later than the Souhegan and give pickings of good size until the Gregg is about gone." The stock is now controlled by Albertson & Hobbs, Bridgeport, Ind., and was first offered by them in 1892.

WALKER. [Red, *Idœus.*] Fruit large, round, firm, deep crimson, of second quality; spines red. Originated by W. D. Brinckle of Philadelphia and placed on the promising list of the American Pomological Society in 1854, but never largely introduced. Named probably in honor of Samuel Walker of Boston, vice president of the above society for Massachusetts in 1852. The variety is described as large, solid and firm, of a deep crimson, adhering firmly to the stem and keeping a long time upon the plant in good condition.

WAURIGAN. Mentioned by William Parry of New Jersey in 1871 as one of the kinds that had failed with him.

WATERLOO. Mentioned among the varieties planted for trial at the Mississippi Agricultural College in 1888.

WELCH. [Red.] Appears to have been sent out from New Jersey in the spring of 1883. T. T. Lyon reports it early, medium to large, roundish oblong, bright red, of good quality, rather acid, productive, but lacking in vigor. Mr. Farnsworth of Ohio reported unfavorably in 1886. The Alabama experiment station reports it lacking in vigor, productiveness and hardiness; fruit dark red, large, firm and good.

WESTCHESTER. [Black Cap.] A chance seedling originated in 1861 in the garden of Leve J. Mabie, Tarrytown, West Chester county, N. Y. It was advertised quite extensively by the originator some years later as a valuable sort, earlier than Doolittle, but seems to have received little commendation aside from the report of a committee which visited the original plantation.

WESTERN TRIUMPH. See GREGG.

WETHERBEE. [Purple Cap.] T. T. Lyon reported in 1883 that it was little known, though not new. It was similar to Ganargua and

Shaffer, but too small, not fruitful, and very late. It seems to have originated in New Jersey, and to have been introduced in 1880.

WHITE ANTWERP. See YELLOW ANTWERP.

WHITE CAP. See AMERICAN White.

WHITE MOUNTAIN. [Red.] Tender, late, unproductive, rather soft and of poor quality. (S. T. Maynard, Hatch experiment station, Bulletin 21, 1893, p. 10.)

WHITE TRANSPARENT. See SOUCHETTI.

WILDER. See COL. WILDER and MRS. WILDER.

WILLIAMS' PERSEVERING. [Red, *Idæus.*] An old English variety quoted from Johnson in Gardener's "Farmer's Dictionary," N. Y., 1846.

WILMINGTON. [Red, *strigosus.*] See BRANDYWINE.

WILMOT'S EARLY RED. [*Idæus.*] Elliott recorded this in 1865 as an early, small, roundish, English variety, then superseded. See Note IV.

WINANT. [Red, *strigosus.*] Introduced by Frank Ford & Son, of Ravenna, Ohio, who write that it considerably resembles the Thwack, being early, of bright scarlet color, very firm, and of fairly good quality. The canes are more vigorous than those of the Thwack, and have more of a bluish tint. The fruit is a little larger and of better quality. They regard it as the best early variety in cultivation, and think that it came originally from New Jersey. It appeared in the Michigan fruit catalogue when first published in 1878, but was rejected in 1883.

WINONA. [Black Cap.] First offered for sale in 1890 by B. B. Scarff, of New Carlisle, Ohio, though tested for seven years previous. Said to be vigorous and hardy, and to ripen with the Palmer. The fruit is said to be of good size and firm, but to have too much gray bloom. It was reported from the N. Y. experiment station, at Geneva, in 1893 as ripening in mid season, the fruit being large, juicy, firm, sweet and good.

WONDER. [Black Cap.] An everbearing variety originated a few years ago by J. H. Robbins of Arcadia, Ind. Fruit soft and of good quality but plants not very vigorous nor productive.

WOODSIDE. [Black Cap.] A New Jersey variety described by Fuller, previous to 1869, as having light crimson, or dark scarlet canes with few scattering spines, fruit large and globular with little bloom, sweet, juicy and good.

WOODWARD. [Red, *Idæus.*] One of the smallest of Brinckle's seedlings, though larger than our wild species. Fruit round to roundish ovate, crimson, ripening early.

WOODWARD'S RED GLOBE. [*Idæus.*] A large, red, roundish, conical, English variety recorded by Elliott in 1865 as no longer considered valuable in the United States.

YELLOW ANTWERP. [*Idæus.*] (*White Antwerp, Double Bearing Yellow.*) An old foreign variety of unknown origin, cultivated in the United States for more than fifty years. Fruit pale yellow, large, nearly conical, very soft, flavor sweet and good. Canes tender but fairly vigorous

and productive, light yellow, with many spines, sometimes fruiting for months on successive suckers. Season usually about with Cuthbert but shorter.

Robert Manning wrote in 1838 that the White Antwerp should not be grown with the red, as the latter, being more vigorous, would eventually choke the former. See also SWEET YELLOW ANTWERP.

YELLOW CANADA. See ARNOLD'S YELLOW. The white or yellow cap seems also to have Yellow Canada as one of its names.

YELLOW CAP. See AMERICAN WHITE.

YELLOW CHILI. [*Idæus.*] Recorded by A. S. Fuller in 1867 as similar to the Yellow Antwerp but of deeper yellow.

YELLOW CUTHBERT. See GOLDEN QUEEN.

YELLOW DOUBLE BEARING. See YELLOW ANTWERP.

YELLOW PEARL. [Black Cap.] Recorded by Charles Downing in 1869 as a variety of Yellow Cap of superior vigor and productiveness which often produced a fall crop. Fruit darker than the ordinary yellow cap with a slight bloom and more sprightly flavor.

YOSEMITE. [Black Cap.?] Mentioned by William Parry of New Jersey in 1871.

SELECT LIST.

The following raspberries are regarded as the most reliable or promising for general cultivation in the southern peninsula of Michigan and adjacent regions having a similar climate:

BLACK CAPS.

GREGG. Somewhat tender in winter and rather more subject to anthracnose than some other kinds, but still the standard for general cultivation owing to its great vigor and the uniformly large size of its fruit.

NEMAHA. Growing in popularity as a substitute for Gregg, being much like that variety, but more hardy.

PALMER. Taking the place of Souhegan and other first early sorts, on account of its more uniform vigor and productiveness.

Ohio, Hilborn, Kansas and Conrath are perhaps the best of the second early sorts, the latter a new Michigan variety.

PURPLE CAPS.

SHAFFER. Enormously productive, vigorous and hardy. Too tart for some tastes, but prized by many, especially for canning. Generally unpopular in market on account of its color. Columbian is a promising new variety of much the same character.

RED VARIETIES.

CUTHBERT. The standard sort for general cultivation, being vigorous, productive, of good size and color, firm and of good flavor. It sometimes winter kills on damp soils where the growth is excessive, but is generally hardy. Loudon, a new variety to be introduced this season, is said to be much like it, but superior in several respects.

No very satisfactory early varieties are known of this class. The Turner is a reliable sort for family use, but too soft for market. Thwack has valuable market qualities, but is lacking in flavor. Marlboro is fairly satisfactory if given good culture. Hansell is probably the most popular early variety.

SEEDLINGS.

The following list contains the names of persons and institutions engaged in the improvement of raspberries, having varieties not yet named, and not included in the foregoing catalogue:

Brown, Jeremiah, Battle Creek, Mich. [1884.] A chance seedling black cap discovered on his farm in 1865, said to be better than Doolittle.

Burbank, Luther, Santa Rosa, Cal. [1894.] Numerous crossed and hybrid raspberries, some of great promise. Issues catalogues of his new varieties of fruits and flowers.

Carman, E. S., River Edge, N. J. Various seedlings and hybrids, including a hybrid between a raspberry and a blackberry.

Carpenter, Chas., Kelley's Island, Ohio. Sent out a seedling for trial in 1886.

Central Experimental Farm, Ottawa, Canada. [1894.] Numerous crosses and seedlings have been and are being tested, some of which have proved valuable. Many of these are the production of the director, Prof. Wm. Saunders. John Craig, the horticulturist states: "Of the many crosses between *strigosus* and *occidentalis* fruited at the experimental farm nearly all have been purple."

Crawford, M., Cuyahoga Falls, Ohio. [1894.] Several seedlings on trial, originated elsewhere, including three "purple caps."

Emmitt, J. C., Lawrence, Kansas. [1894.] A promising purple cap, of which he has an acre in bearing.

Ganzhorn, Jacob, Ann Arbor, Mich. [1894.] A seedling black cap.

Griesa, A. H., Lawrence, Kansas. [1894.] Grew several hundred seedling black caps, but none as good as his "Kansas," discovered by chance. See CARDINAL.

Hathaway, Benjamin, Little Prairie Ronde, Mich. [1894.] Two promising black caps. Has grown raspberry seedlings many years.

Hawkins, J. R., Mountainville, N. Y. [1894.] Has originated numerous raspberry seedlings, but none considered worthy of propagation.

Haynes, J. H., Delphi, Ind. [1894.] Several varieties. A seedling of Gregg, which originated seven years ago, is on trial at the New York experiment station at Geneva, and may be named and introduced in the fall of 1894.

Illinois Experiment Station, Champaign, Ill. Has crossed and selected raspberry seedlings on trial of its own production.

Loudon, F. W., Janesville, Wis. [1894.] Twenty unnamed seedling red varieties, "six of them surpassing the Cuthbert in size and productiveness."

Macomber, J. T., Adams, Vt. [1894.] A purple cap likely soon to be introduced.

Macomber, L. M., North Ferrisburgh, Vt. Various seedlings.

Marvin, D. S., Watertown, N. Y., "grew a dozen or more seedlings of Gregg crossed with Tyler, in which were three amber colored albinos."

Mills, Charles, Fairmount, N. Y. [1894.] Seedlings of Gregg, three of which are mentioned in the foregoing catalogue.

Minnesota Experiment Station, St. Anthony Park, Minn. [1892.] About 500 seedlings of Shaffer fruited that year for the first time. The fruit closely resembled that of the parent, and some of the varieties appeared fully as valuable. Fifty were selected for further trial.

Missouri Experiment Station, Columbia, Mo. [1891.] Two thousand seedling raspberries ready to fruit in 1892.

Palmer, F. R., Mansfield, Ohio. [1894.] Many seedlings, but no others equal to the Palmer, already introduced. From the Shaffer he produced a thornless variety, of no special merit. From the Gregg he produced plants similar in leaf and cane to the parent, most of them late, some quite large and fine, but none surpassing their parent.

Powell, E. P., Clinton, N. Y. [1893.] "A dozen good seedlings," includ- two crosses between Philadelphia and Cuthbert.

Salzer (John A.) Seed Company, La Crosse, Wis. [1884.] A cross between Souhegan and Earhart, to be introduced in the fall of 1893. Canes said to be less vigorous than Souhegan, but very hardy and productive and the fruit larger than that of either of its parents. Origin Illinois, 1887.

Thornburg, Thomas E., Ashland, Ohio. [1894.] A promising yellow variety.

Whitmore, H. B., Gulick, N. Y., Sent a seedling "white cap," to the Geneva experiment station in 1886.

NOTES.

I.

Condensed from an article by Thomas Rivers of Sawbridgeworth, England, in the *Gardeners' Chronicle*, 1867, p. 516:

About 1825 Mr. Rivers obtained from another English gardener some plants of the black cap raspberry. He raised from these several generations of seedlings, not knowing apparently that the species could be propagated in any other way. There was little variation noted in the seedlings produced until about 1855 when, having obtained the Ohio Everbearing from America he noticed among his other black cap seedlings a few plants having the vigor and blue stems of that variety. When these young plants came into bearing they also produced an autumnal crop. These plants Mr. Rivers believed to have been produced by cross fertilization from the Ohio Everbearing upon his other black caps. The new autumnal bearing seedlings he continued to perpetuate from seed.

"The result," Mr. Rivers says, "of my sowing carefully selected seed from the finest purple berries produced in autumn is most curious. I have had red summer berries, red and pink, flesh colored, and large white autumnal sorts, yellow summer and yellow autumnal varieties, small berried black autumnal raspberries of gigantic growth, making strong canes, fifteen feet in length, and some dwarf bushes two feet in height, in short such a *melange* as I think never before was seen in a bed of raspberries. It would take a long chapter to describe them but as the greater portion were horticulturally valueless they have been destroyed. I have, however, settled down to a few sorts which seem as if they would, with the exception of a few slight vagaries, prove constant. One a large black autumnal variety with blue canes, ripening in October; another with large black berries and with canes not so blue, ripening in August; another with very large orange berries, and another with large white berries covered with a glaucous bloom, both ripening in October. It is curious to note that the sorts with pale berries put forth suckers from the roots like the common kinds of raspberries, whereas those with blue canes and black berries put forth none, yet all came from the same source, the black autumnal hybrids. From these four seedlings I raised in 1866 some hundreds of seedlings. They are now in the second year of their growth and are of much interest. Those from the black berried hybrids seem to adhere to the character of their parents in having shoots more or less purple; still a few of them have white spines and will probably give white or yellow fruit. Those from the large orange variety—one of the largest raspberries I have ever seen—seem to adhere pretty closely to the habit of their parent, having white spines. Nearly all these strange hybrids seem to partake of the character of the Ohio Everbearing in their tendency to produce a more abundant crop of fruit in the autumn than in summer."

II.

H. J. Seymour, in the *American Garden:* "During the years 1865 to 1867 I sowed seeds of black raspberries taken from a field in which they grew together with white and red ones. Among the seedlings came up nearly a score which when transplanted shot up much higher than the rest, had red or purple canes and imperfect berries. But three of them were smaller, very prolific, with undersized red berries of pleasant flavor. In 1868 I purposely selected berries of the Miami black cap from rows adjoining rows of Hornet, Herstine and Brinckle's Orange, the seeds of all of which I sowed, and

among my numerous seedlings were many undoubted hybrids. The cross between Miami and Brinckle's Orange was a curiosity. The bush was like its black parent, but much smaller and weaker. The berries were white, with the ends spattered over with black. I raised many seedlings from the red berries that these hybrids bore; they all seemed to have the same characteristics as their parents, and fully satisfied me as to their being true hybrids."

III.

From editorial in *Rural New Yorker*, 1888, p. 108:

"In the summer of 1886 we applied pollen of the raspberry to the stigmas of blackberry flowers and *vice versa*, carefullly removing the anthers before the flowers were open and covering the flowers operated upon with tissue paper to exclude foreign pollen. Some 20 seeds formed on the blackberries, and perhaps twice as many on the raspberries. In many cases a single drupe would form, sometimes two or three, rarely more, and never a perfect berry. The seeds were planted at once, separately in shallow boxes but did not germinate until the next spring. Many of the raspberry seeds then sprouted and nine plants lived and were set out in May. The blackberries did not sprout at all. In October, 1888, the following notes were taken on the nine hybrid plants. The first plant is three feet high, much branched, with light green canes covered with raspberry prickles; leaflets large, with an occasional imperfect five-pedate leaf, under side of leaf glaucous. Second plant 3½ feet high, without laterals and nearly without prickles, scarcely any bloom on the under side of the leaf; leaflets large and much wrinkled as in the foreign raspberry; stem purplish. The third is a puny plant, about nine inches high, with the prickles of a raspberry and the leaf of a blackberry. The fourth is 2½ feet high, with long laterals, purple stem, hooked thorns like the blackberry but closer together: leaflets small, with no bloom on the under side, resembles a blackberry more than a raspberry. The fifth seems to be a small sickly raspberry, with slender close jointed stems. The sixth seems to be a thornless raspberry. The seventh has large wrinkled leaflets with very little bloom beneath, borne on two vigorous stems 2½ feet high; stems light green on one side, light purple on the other; prickles many and long, but slender and soft. The eighth is 2½ feet high, with numerous branches, both these and the leaves resembling the blackberry; leaves without bloom, several of them pedate; prickles hooked, stiff and numerous. The nineth is only nine inches high, but healthy and resembles the blackberry except that the thorns are crowded and there are no pedate leaves. In general, some of these nine plants look just like the blackberry, others just like the black or red raspberry, while two or three resemble both parents. Nevertheless all grew from raspberry seeds."

IV.

Forsyth recorded in 1818 the following varieties of the raspberry then cultivated in England: Early White, Double Bearing White, Large Common White, Large Red, Large Red Antwerp, Large Yellow Antwerp, Smooth Cane Double Bearing, Woodward's New Raspberry.

The following varieties of *Rubus Idæus* were cultivated in the garden of the London Horticultural Society in 1826:

Antwerp, Double Bearing Yellow.
Antwerp, Late Bearing.
Antwerp, Red (*Burley*).
Antwerp, Yellow (White Antwerp).
Barnet (*Cornwall's Prolific, Cornwall's Seedling, Cornwall's Red, Large Red*).
Cane, Brentford.
Cane, Red.
Cane, Rough.
Cane, Smooth.
Common Red (*Old Red, Wild Red*).
Cornish.
Double Bearing (*Red Double Bearing, Perpetual Bearing, Siberian*).
Double Bearing Red, Williams' (*Pitmaston*).
Jilliard's Seedling.
Lord Exmouth's.
Malta, Red.
Old White.
Prolific, Early.
Spring Grove.
Superb.
Taylor's Paragon (*Scarlet Paragon*).
Wilmot's Early Red.
Woodward's Red Globe.

The American species were on trial with the hope that they might "become deserving of garden cultivation."

AGRICULTURAL COLLEGE, MICH., *June 25, 1894.*

BULLETIN 112. JUNE, 1894.

MICHIGAN

STATE AGRICULTURAL COLLEGE

EXPERIMENT STATION.

CHEMICAL DEPARTMENT.

FERTILIZER ANALYSES.

BY R. C. KEDZIE.

AGRICULTURAL COLLEGE, MICH.
1894.

The Bulletins of this Station are sent free to all newspapers in the State, and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.

MICHIGAN AGRICULTURAL EXPERIMENT STATION.

Postoffice and Telegraph Address, ... Agricultural College, Mi
Railroad and Express Address, ... Lansing, Mich.

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South Haven, Van Buren County, 10 acres rented; 5 acres deeded; Hon. T. T. Lyon, Local Agent.

INSPECTION OF COMMERCIAL FERTILIZERS.

Act No. 26, session laws of 1885, provides for the inspection of commercial fertilizers in this State. The law has been in force for nine years. It was designed primarily for the protection of farmers, and secondarily to protect honorable manufacturers who place reliable goods upon the market from the competition of untrustworthy dealers who seek to place fertilizers of inferior quality upon the market and sell worthless stuff for high-priced manures. The strict enforcement of the law has driven some inferior goods out of the market, has improved the quality of many fertilizers by keeping manufacturers up to the quality claimed for their goods, and in these several ways has saved thousands of dollars to our people. Michigan has ceased to be the dumping-ground for fertilizers of so poor quality as to be unsalable in other states.

OBJECT OF CHEMICAL ANALYSIS.

In these analyses attention is directed exclusively to nitrogen, potash and phosphoric acid, in form available for the plant. These are not the only materials concerned in raising crops, but they are the only manurial materials for which the farmer can afford to pay more than ten dollars a ton. The common soil materials, lime, magnesia, silica, alumina, oxide of iron, etc., make up the bulk of our soils, which the farmer cannot afford to buy at twenty to thirty dollars a ton to manure his fields made up of the same materials. These common soil materials, aside from nitrogen, potash and phosphates, do not enter into consideration in making up an estimate of the value of any fertilizer.

COMPLAINTS OF DEALERS.

A few dealers complain of the injustice of paying a license fee of twenty dollars, when the profits of the sales for a season may be little more than the license fee, and that they should not be taxed until they had established a paying business. In some states the license fee is graded by the number of tons of fertilizers sold during the year, but that is not the law in this State. Our law was planned for persons who carry on a commercial business and not a huckstering trade. If the business is too small to justify a license it is too small for this climate. It would be manifestly unfair to allow a trade to go forward in hopes of building up a paying

trade in competition with dealers who have paid their license fee and demand the protection of the law.

MANUFACTURERS SHOULD PROTECT THEIR RETAIL DEALERS.

By the proviso to section 3 of the law a dealer in this State is not required to take out a license for the sale of any fertilizer if the manufacturer has taken out a license for such fertilizer. In this way the manufacturer can protect all his agents in this State by payment of a single fee. Otherwise each dealer must take out a license. The object of the law is not merely to collect a revenue, but to secure the analysis and certification of every fertilizer sold in the State. If, then, any manufacturer neglects or refuses to take out a license for his goods, it would be a matter of prudence for all dealers to refuse his goods, and sell only the fertilizers of such manufacturers as will protect their agents in the State. If outside manufacturers neglect their State agents, then the law exacts the fee for license from each dealer in the State.

One Cleveland party refuses to pay for a license on nitrate of soda, which is largely used for fertilizer, because they did not manufacture the material and sold it simply as a chemical substance, "and in no State in the Union do we pay a license fee for selling them."

A letter addressed to the person in charge of the chemical department of the Ohio experiment station elicited the reply, "but should it be offered to the farmers as a 'fertilizer' it would have to be registered as such and analyzed, and the packages marked with analysis. The fact of its importation would be of no consequence; we consider merely whether it is on the market as a fertilizer and sold to farmers." In many of the eastern states it is considered as requiring the same treatment for license as other fertilizers. Under these conditions the chloride and sulphate of potassium, nitrate of sodium and similar commercial salts used for fertilizers will require a license fee in this State.

It may seem a hardship to the dealer to require a license from each one for every brand of fertilizer he offers for sale. Yet it is obvious that the system of inspecting and licensing is necessary to protect the farmers from heavy loss. If a license is required of one, it must be required of all.

OBJECT OF INSPECTION OF COMMERCIAL FERTILIZERS.

The law does not prescribe any standard for the composition of a commercial fertilizer, the manufacturer being free to make his own standard, the law simply requiring that the fertilizers offered for sale shall be up to the standard set up by the manufacturer. The license to sell does not certify to the value of the fertilizer, but simply states that the manufacturer or dealer offers for sale a fertilizer for which a certain content of nitrogen, potash and phosphoric acid is claimed, and that samples of such fertilizers have been deposited with the secretary of the college with affidavit regarding the composition. Analysis is then made of each of these fertilizers, gathered in the open market as far as possible, and the results of such analysis published in bulletin. The *claimed* composition and *found* composition are arranged in parallel lines, so that the real com-

position can be compared at a glance with the composition claimed for it by manufacturer. In this way the buyer can see at once by this bulletin whether the fertilizer is as good as the claims made for it.

WHAT TO LEARN FROM THE ANALYSIS.

The three most valuable materials in commercial manures are potash, phosphoric acid and available nitrogen. Each of these has a commercial value, and the worth of any given quantity in the market may be stated in dollars and cents. Only these three substances are considered in the inspection of commercial fertilizers, because the other materials are of too little value to be purchased at high prices. The essential value of these fertilizers lies in the potash, phosphoric acid and available nitrogen they contain. The law does not prescribe the amount of these substances in any fertilizer, but requires the manufacturer or dealer to certify the composition of the fertilizer, and to deposit a sample of the fertilizer with the Secretary of the State Board of Agriculture. In this way the composition of the fertilizer as claimed by the manufacturer is offered to the public. Samples of the fertilizer are gathered in the open market, and analyzed, and the results directly compared with the claims of the manufacturer in the bulletin. The farmer can thus find in the bulletin, on lines opposite each fertilizer, the amount of nitrogen, phosphoric acid and potash as claimed by the manufacturer, and as actually found by analysis at this laboratory. If the analysis shows more of any given substance than is claimed, the goods are better than claimed; but if much less is found on analysis than is claimed, then the goods are proportionately of less value to the farmer. For example, an Ohio potato fertilizer was recently sold in the State that fell short of the claimed amount of available nitrogen by more than two per cent, and of potash by more than three per cent, and the fertilizer was not worth so much as claimed by $11 a ton. By consulting the tables in the bulletin, the market value of these commercial fertilizers can be estimated on the basis that available phosphoric acid is worth eight cents a pound, insoluble phosphoric acid three cents, potash six cents and ammonia eighteen cents. As there are 20 times 100 pounds in a ton, if we multiply the value of a pound by 20, we get the value of one per cent of each substance, and thus obtain a factor for obtaining the value of the material in a ton from the percentage given in the tables of the bulletin. One per cent means 20 pounds in a ton, and if the material is worth eight cents a pound then each per cent equals $1.60 a ton.

Multiply $1.60 by the per cent. of available phosphoric acid.
" .60 " " insoluble " "
" 3.60 " " ammonia.
" 1.20 " " potash.

The sum will give the market value of a ton of such fertilizer. Take for example Vegetable Bone fertilizer as found last year:

Ammonia 5.76 % × $3.60=	$20.74
Available phosphoric acid 5.40 % × 1.60=	8.64
Insoluble " " 1.48 % × .60=	89
Potash 7.80 % × 1.20=	9.36
Market value per ton	$39.62

The law respecting inspection and licensing commercial fertilizers is again inserted, because so many seem to be ignorant of its provisions:

[Session Laws of 1885, No. 26.]

AN ACT to provide for the inspection of commercial fertilizers and to regulate the sale thereof.

SECTION 1. *The People of the State of Michigan enact,* That any person or persons who shall sell or offer for sale in this state any commercial fertilizer, the retail price of which exceeds ten dollars per ton, shall affix on the outside of every package containing such fertilizer a plainly printed certificate, stating the number of net pounds therein; the name or trade mark under which such article is sold; the name of the manufacturer; the place of manufacture, and a chemical analysis, stating the percentage of nitrogen in an available form; of potash soluble in water, and of phosphoric acid in available form (soluble or reverted) and the insoluble phosphoric acid.

SEC. 2. Before any commercial fertilizer is sold or offered for sale, the manufacturer, importer, or party who causes it to be sold or offered for sale within this state, shall file with the secretary of the State Board of Agriculture a certified copy of the analysis and certificate referred to in section one, and shall also deposit with said secretary a sealed glass jar containing not less than two pounds of such fertilizer, with an affidavit that it is a fair sample of the article thus to be sold or offered for sale.

SEC. 3. The manufacturer, importer, or agent of any commercial fertilizer, the retail price of which exceeds ten dollars per ton as aforesaid, shall pay annually to the secretary of the State Board of Agriculture, on or before the first day of May, a license fee of twenty dollars for each and every brand of fertilizer he offers for sale in this state: *Provided,* That whenever the manufacturer or importer shall have paid this license fee his agents shall not be required to do so.

SEC. 4. All such analyses of commercial fertilizers required by this act shall be made under the direction of the State Board of Agriculture and paid for out of the funds arising from the license fees provided for in section three. At least one analysis of each fertilizer shall be made annually.

SEC. 5. The secretary of the State Board of Agriculture shall publish in his annual report a correct statement of all analyses made and certificates filed in his office, together with a statement of all moneys received for license fees, and expended for analysis. Any surplus from license fees remaining on hand at the close of the fiscal year shall be placed to the credit of the experimental fund of said board.

SEC. 6. Any person or persons who shall sell or offer for sale any commercial fertilizer in this state without first complying with the provisions of sections one, two, and three of this act, or who shall attach or cause to be attached to any such package or fertilizer an analysis stating that it contains a larger percentage of any one or more of the constituents or ingredients named in section one of this act than it really does contain shall, upon conviction thereof, be fined not less than one hundred dollars for the first offense, and not less than three hundred dollars for every subsequent offense, and the offender shall also be liable for damages sustained by the purchaser of such fertilizer on account of such misrepresentation.

SEC. 7. The State Board of Agriculture by any duly authorized agent is hereby authorized to select from any package of commercial fertilizer exposed for sale in this state, a quantity, not exceeding two pounds, for a sample, such sample to be used for the purposes of an official analysis and for comparison with the certificate filed with the secretary of the State Board of Agriculture and with the certificate affixed to the package on sale.

SEC. 8. All suits for the recovery of fines under the provisions of this act shall be brought under the direction of the State Board of Agriculture.

Approved March 10, 1885.

For the information of the parties concerned, the fertilizers that have been licensed for 1894 are contained in the list of this bulletin; also those that have not been licensed and whose sale is illegal in this state are marked with a star.

The primary object of this law is to give information in regard to the composition of commercial fertilizers, and to protect farmers from imposition and loss. The question of their agricultural value, and relation to

crops and different kinds of soils is not touched. These subjects require a separate examination for determining the relative value of any given fertilizer with reference to different soils and crops. The farmer can settle for himself such questions by trials of the fertilizer on a small portion of a field by comparing the results with other parts of the same field and crop on which no fertilizer has been applied. The conditions of crop, soil, and climate are thus brought home to him more completely than any investigation in other places and conditions can furnish.

How the state may place before the farmers the agricultural value of the various fertilizers offered for sale is a very different subject from that contemplated by this law for the inspection of such fertilizers. The law of inspection offers no advice whether the farmer shall buy such fertilizers, or depend upon the home supply. In case he determines to buy, it affords him some basis for calculating the commercial value of the different brands offered for sale, and to select honest goods which are found to be the same in the market as are claimed by the seller. He may also be on his guard not to buy the goods which are not licensed for sale as not worthy of confidence.

With this brief statement of the objects sought by inspection, and the results of analysis of goods selected in the open market as compared with the claims of the manufacturer, this Bulletin is submitted to the public.

R. C. KEDZIE,
Chemist of Experiment Station.

AGRICULTURAL COLLEGE, *June 14, 1894.*

Analysis of Commercial

Manufacturer.	Trade Name.	Dealer and Locality.
Michigan Carbon Works, Detroit, Mich.	Homestead Vegetable Grower	Geo. Hancock, Grand Haven
Michigan Carbon Works, Detroit, Mich.	Homestead Potato Grower	J. Mulder & Brueker, Graafschap
Michigan Carbon Works, Detroit, Mich.	Banner Dissolved Bone	J. F. Farnum, Kalamazoo
Michigan Carbon Works, Detroit, Mich.	Jarves Celery Grower	Geo. Hancock, Grand Haven
Michigan Carbon Works, Detroit, Mich.	Homestead Superphosphate	Sieb. Baier, Monroe
Michigan Carbon Works, Detroit, Mich.	Homestead Bone Black Fertilizer	Geo. Hancock, Grand Haven
Michigan Carbon Works, Detroit, Mich.	Jarves Drill Phosphate	C. B. Waterloo, Port Huron
Michigan Carbon Works, Detroit, Mich.	Desiccated Bone and Potash	Manufacturer
Detroit Sanitary Works, Detroit, Mich.	Superior Potato Fertilizer	Manufacturer
Detroit Sanitary Works, Detroit, Mich.	Clover Leaf Fertilizer	Manufacturer
H. J. Baker & Bros., New York	*"B" for Onions	Alfred Brown, Grand Rapids
H. J. Baker & Bros., New York	*"G" Strawberry Fertilizer	Alfred Brown, Grand Rapids
H. J. Baker & Bros., New York	*Turnip Fertilizer	Alfred Brown, Grand Rapids
H. J. Baker & Bros., New York	*Cabbage Fertilizer	Alfred Brown, Grand Rapids
H. J. Baker & Bros., New York	Lawn Fertilizer	Alfred Brown, Grand Rapids
H. J. Baker & Bros., New York	"D" Vegetable and Vine Fertilizer	Alfred Brown, Grand Rapids
H. J. Baker & Bros., New York	*"A" Potato Fertilizer	Alfred Brown, Grand Rapids

*Not licensed: Sale unlawful if the retail price exceeds $10 a ton. Penalty for selling or offering for sale, a fine of $100. See section 6 of the law.

Fertilizers in Michigan for 1894.

	Available Nitrogen.	Phosphoric Acid.			Potash Soluble in H_2O.	
	Estimated as $N H_3$.	Available $P_2 O_5$.	Insoluble $P_2 O_5$.	Total $P_2 O_5$.	Estimated as $K_2 O$.	Estimated as $K_2 SO_4$.
Claimed	4.60 to 5.35	4.50 to 6.50	.5 to 1.50	5 to 8	6.50 to 7.50	
Found	6.43	7.21	.38	7.59	4.25	7.86
Claimed	1.85 to 2.60	7.50 to 11.50	.5 to 1.50	8 to 13	3.50 to 4	
Found	2.64	9.52	1.60	11.12	3.67	6.79
Claimed		28 to 32		32 to 36		
Found		26.56	6.25	32.81		
Claimed	1			1	1	
Found	2.48	12.77	.87	13.64	.66	1.23
Claimed	1.85 to 2.40	7.50 to 11				2.75 to 3.50
Found	3.04	9.57	.79	10.36	4.04	7.47
Claimed	1.85 to 2.40	7.50 to 11.50	.5 to 1.50	8 to 13	1.50 to 2.00	
Found	2.89	10.03	1.03	11.06	1.87	3.45
Claimed	1.25 to 2	7.50 to 9.50	2 to 3	9.50 to 12.50		
Found	1.31	9.02	.75	9.77		
Claimed	1.25 to 2.25			25 to 30	1.50 to 2.50	
Found	1.70			28.65	2.88	5.30
Claimed						
Found	4.62	5.75	1.76	7.51	4.15	7.67
Claimed	2 to 3			8 to 10	2 to 3	4 to 6
Found	2.63	7.91	2.11	10.02	2.42	4.47
Claimed						
Found	4.34	5.55	1.73	7.38	10.20	18.87
Claimed						
Found	2.55	5.83	2.40	8.23	12.17	22.51
Claimed						
Found	4.08	5.51	1.85	7.36	10.47	19.36
Claimed						
Found	3.45	12.08	.46	12.54	3.43	6.34
Claimed	4.50 to 5	5 to 6			7.50 to 9	
Found	4.59	5.25	2.30	7.55	10.34	20.06
Claimed						
Found	2.11	5.55	2.07	7.62	12.18	22.53
Claimed	3 to 6	5 to 8			7 to 10	
Found	5.17	5.40	1.60	7.	10.51	19.44

Analysis of Commercial Fertilizers

Manufacturer.	Trade Name.	Dealer and Locality.
Swift & Co., Chicago, Ill.	* Ground Tankage	Martin Keift, Grand Haven
Swift & Co., Chicago, Ill.	* Dried Blood	S. M. Isbell, Jackson
Swift & Co., Chicago, Ill.	Pure Ground Strained Bone	Martin Keift, Grand Haven
Swift & Co., Chicago, Ill.	Pure Raw Bone Meal	John Wallace, St. Joseph
Armour & Co., Chicago, Ill.	Pure Bone Meal	Stevens, Morton & Co., Benton Harbor
Armour & Co., Chicago, Ill.	High Grade Bone and Blood	Stevens, Morton & Co., Benton Harbor
Armour & Co., Chicago, Ill.	High Grade Dissolved Bone	Stevens, Morton & Co., Benton Harbor
Armour & Co., Chicago, Ill.	Quick Acting Bone	Manufacturer
The Zell Guano Co., Baltimore, Md.	Zell's Electric Phosphate	A. Farmington, Holland
The Zell Guano Co., Baltimore, Md.	Zell's Special Compound	A. Farmington, Holland
The Zell Guano Co., Baltimore, Md.	Zell's Dissolved Bone Phosphate	A. Farmington, Holland
The Zell Guano Co., Baltimore, Md.	Zell's Calvert Guana	A. Farmington, Holland
Northwestern Fertilizer Co., Chicago, Ill.	Prairie Phosphate	W. A. Hayes, Rochester
Northwestern Fertilizer Co., Chicago, Ill.	Fine Ground Bone	M. Wolverton, Blissfield
Northwestern Fertilizer Co., Chicago, Ill.	Garden City Superphosphate	W. A. Hayes, Rochester
Northwestern Fertilizer Co., Chicago, Ill.	Fine Raw Bone	Reed, Carlton & Co., Jackson
Northwestern Fertilizer Co., Chicago, Ill.	Challenge Corn Grower	Mr. Tinhult, Graafschap

* Not licensed: Sale unlawful if the retail price exceeds $10 a ton. Penalty for selling or offering for sale a fine of $100. See Sec. 6 of the law.

in Michigan for 1894.—CONTINUED.

	Available Nitrogen.	Phosphoric Acid.			Potash—Soluble in H_2O.	
	Estimated as NH_3.	Available P_2O_5.	Insoluble P_2O_5.	Total. P_2O_5.	Estimated as K_2O.	Estimated as K_2SO_4.
Claimed						
Found	9.16	4.90	4.31	9.21		
Claimed						
Found	16.52				.22	.40
Claimed	3.74			26.09		
Found	3.23			27.18		
Claimed	5.04			24.47		
Found	5.10			25.64		
Claimed	3.10			28.28		
Found	3.23			24.88		
Claimed	8.25	5.56	4.53	10.09		
Found	8.31	5.18	4.73	9.91		
Claimed	2.20	10.49	4.99	15.48	.09	
Found	4.93	7.18	6.76	13.94	.09	.16
Claimed	3	9.86	11.44	21.30		
Found	1.77	9.05	11.61	20.66		
Claimed		10 to 12	1 to 2	11 to 14	4 to 5	
Found		12.96	1.40	14.36	3.74	6.91
Claimed	3 to 4	8 to 10	1 to 2	9 to 12	4 to 5	
Found	2.89	9.54	.65	10.19	4.06	7.51
Claimed		13 to 16	1 to 2	14 to 18		
Found		14.05	1.49	15.54		
Claimed	.75 to 1.25	9 to 11	1 to 2	10 to 13	1.50 to 2.50	
Found	.99	10.72	.79	11.51	2.10	3.88
Claimed	2 to 2.50	6 to 8	3 to 4	9 to 12		
Found	2.69	5.18	4.69	9.87		
Claimed	3 to 4			18 to 22		
Found	4.52			17.39		
Claimed	2.50 to 3.50	8 to 9	4 to 4.50	12 to 13.50	.54 to 1.08	
Found	2.40	8.33	4.01	12.34	.59	1.69
Claimed	4 to 5			22 to 24		
Found	4.68			22.70		
Claimed	2.50 to 3.50	8 to 9	4 to 4.50	12 to 13.50	.54 to 1.08	
Found	2.64		3.97	12.60	1.96	3.62

Analysis of Commercial Fertilizers

Manufacturer.	Trade Name.	Dealer and Locality.
Northwestern Fertilizer Co., Chicago, Ill.	Potato Grower	M. Wolverton, Blissfield
Northwestern Fertilizer Co., Chicago, Ill.	Celery Grower	Manufacturer
Michigan Phosphate Co., Saginaw, E. S., Mich.	* Pure Fine Ground Bone	Manufacturer
Michigan Phosphate Co., Saginaw, E. S., Mich.	* Rich Harvest	Manufacturer
Michigan Phosphate Co., Saginaw, E. S., Mich.	Bone and Meat Phosphate	Manufacturer
W. S. Dunbar, St. Joseph, Mich.	* Fish Guano	Manufacturer
W. S. Dunbar, St. Joseph, Mich.	* Meat and Bone	Manufacturer
Dunbar & Schwartz, Grand Haven, Mich.	Celery Hustler	Manufacturer
Great Eastern Fertilizer Co., New York	* Great Eastern General Potato Manure	Chas. Griggs, Rochester
Great Eastern Fertilizer Co., New York	* Great Eastern Corn Phosphate	Gill R. Lovejoy, Lenox
Joseph Lister, Chicago, Ill.	Pure Bone Meal	G. Van Bochove, Kalamazoo
Pottstown Iron Co., Pottstown, Pa.	* Odorless Phosphate	Davis & Co., Ypsilanti
Grand Rapids Glue Co., Grand Rapids, Mich.	Non Plus Ultra	Perkins & Hess, Grand Rapids
Heller, Hirsh & Co., 164 Front St., New York	* Nitrate of Soda	S. M. Isbell, Jackson
Heller, Hirsh & Co., 164 Front St., New York	* Muriate of Potash	S. M. Isbell, Jackson
James Boland, Jackson, Mich.	Blackman Fertilizer	Manufacturer
Mape's Formulæ and Peruvian Guano Co., New York	* Mape's Manure for Potatoes	Henry Hope, Port Huron

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in Michigan for 1894.—CONTINUED.

	Available Nitrogen.	Phosphoric Acid.			Potash Soluble in H_2O.	
	Estimated as NH_3.	Available P_2O_5.	Insoluble P_2O_5.	Total P_2O_5.	Estimated as K_2O.	Estimated as K_2SO_4.
Claimed	3 to 4	7 to 9				4 to 5
Found	2.98	8.00	4.79	12.79	1.94	3.58
Claimed	3 to 4	7 to 9				4 to 5
Found	3.40	7.60	4.05	11.65	2.43	4.49
Claimed	4.50 to 5.50			21 to 24		
Found	5.88			23.95		
Claimed	2 to 3			9 to 11	1 to 2	
Found	3.01	6.24	2.68	8.92	1.79	3.31
Claimed	3.50 to 5			10 to 13	2 to 3	
Found	4.17	6.11	2.73	8.84	1.44	2.66
Claimed						
Found	7.72	1.59	2.36	3.95	.25	.46
Claimed						
Found	4.05	5.96	4.62	10.58	.16	.29
Claimed						
Found	7.43	2.83	.76	3.59	1.13	2.09
Claimed						
Found	2.70	8.88	.39	9.27	4.68	8.65
Claimed						
Found	2.23	8.67	.44	9.11	6.09	11.26
Claimed	3.05			24.65		
Found	4.51			24.11		
Claimed		4.92	15.95	20.87		
Found		8.03	11.35	19.38		
Claimed						
Found	4.25	3.42	7.82	11.24	.35	.65
Claimed						
Found	15.33					
Claimed						
Found					49.75	
Claimed	1.05	5.38	1.31	6.69	.27	
Found	1.07	2.69	3.36	6.05	.26	.48
Claimed						
Found	4.25	7.93	1.39	9.32	7.45	13.78

Analysis of Commercial Fertilizers

Manufacturer.	Trade Name.	Dealer and Locality.
Crocker Chemical Co., Buffalo, N. Y.	Vegetable Bone Superphosphate	C. Van Doren, Adrian
Crocker Chemical Co., Buffalo, N. Y.	Ammoniated Bone Superphosphate	C. P. Coddington, Morenci
Crocker Chemical Co., Buffalo, N. Y.	Special Potato Manure	C. A. Slayton, Tecumseh
Crocker Chemical Co., Buffalo, N. Y.	New Rival Ammoniated Superphosphate	Guy Kimball, Port Huron
Crocker Chemical Co., Buffalo, N. Y.	Buffalo Superphosphate No. 2	D. B. Kressler, Rochester
Crocker Chemical Co., Buffalo, N. Y.	Ammoniated Practical Superphosphate	Roberts & Vanson, Niles
Crocker Chemical Co., Buffalo, N. Y.	Ammoniated Wheat and Corn Superphosphate	D. B. Kressler, Rochester
Crocker Chemical Co., Buffalo, N. Y.	Pure Ground Bone	Guy Kimball, Port Huron
Crocker Chemical Co., Buffalo, N. Y.	* Potato Phospate	Martin & Blood, Hudson
Crocker Chemical Co., Buffalo, N. Y.	Ground Bone Meal	Manufacturer
Crocker Chemical Co., Buffalo, N. Y.	Niagara Phosphate	Manufacturer
Crocker Chemical Co., Buffalo, N. Y.	Lawn Fertilizer	Manufacturer
Crocker Chemical Co., Buffalo, N. Y.	Potato, Hop and Tobacco Phosphate	Manufacturer
Cleveland Dryer Co., Cleveland, O.	Potato Fertilizer	Jesse Rogers, Lenawee Junct'n
Cleveland Dryer Co., Cleveland, O.	Ohio Seed Maker	L. B. Spencer, Holloway
Cleveland Dryer Co., Cleveland, O.	Square Bone	E. W. Spencer, Petersburgh

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in Michigan for 1894.—CONTINUED.

	Available Nitrogen.	Phosphoric Acid.			Potash Soluble in H_2O.	
	Estimated as $N H_3$.	Available $P_2 O_5$.	Insoluble $P_2 O_5$.	Total $P_2 O_5$.	Estimated as K_2O.	Estimated as $K_2 SO_4$.
Claimed	6 to 7	6 to 7	1 to 2	7 to 9	6 to 8	11 to 15
Found	6.34	5.69	.91	6.60	5.77	10.67
Claimed	3.5 to 4.5	10 to 12	1 to 2	11 to 14	1 to 2	2 to 3
Found	.48	11.71	1.15	12.86	.92	1.70
Claimed	4.5 to 5.5	8 to 9	1 to 2	9 to 11	5.4 to 6.4	10 to 12
Found	4.61	6.59	.98	7.47	6.02	11.13
Claimed	1.5 to 2.5	10 to 12	1 to 3	11 to 15	1.6 to 3	3 to 5
Found	1.78	9.41	1.86	12.27	1.87	3.45
Claimed	----------	11 to 13	1 to 2	12 to 15	1.35 to 2	2.5 to 3.5
Found	----------	12.27	1.95	14.22	1.19	2.20
Claimed	1 to 2	8 to 10	1 to 2	9 to 12	1 to 2	2 to 3
Found	1.29	9.48	.91	10.39	1.35	2.99
Claimed	2.50 to 3.50	10 to 13	1 to 2	11 to 15	1.60 to 2.70	3 to 5
Found	2.58	10.42	.88	11.30	1.96	3.82
Claimed	3.5 to 4.5	----------	----------	25	----------	----------
Found	5.39	----------	----------	22.96	----------	----------
Claimed	----------	----------	----------	----------	----------	----------
Found	4.42	7.84	.42	8.26	6.97	12.89
Claimed	2.5 to 4	----------	----------	25 to 28	----------	----------
Found	3.18	----------	----------	27.05	----------	----------
Claimed	----------	11.5 to 13	1 to 3	12.5 to 16	----------	----------
Found	----------	12.15	1.50	13.65	----------	----------
Claimed	4 to 5	----------	----------	19 to 22	3.25 to 4.30	6 to 8
Found	4.11	----------	----------	23.28	3.26	6.03
Claimed	2.5 to 3.5	10 to 12	1 to 2	11 to 14	3.25 to 4.30	6 to 8
Found	3.09	10.05	1.59	11.64	3.66	6.77
Claimed	4 to 5	8 to 10	----------	10 to 14	4 to 6	----------
Found	1.97	9.37	1.79	11.16	2.49	4.60
Claimed	1.5 to 2.5	10 to 12	----------	15 to 17	----------	----------
Found	1.65	13.45	1.47	14.92	----------	----------
Claimed	3 to 4	6 to 10	----------	20 to 25	----------	----------
Found	3.88	10.94	9.65	20.59	----------	----------

Analysis of Commercial Fertilizers

Manufacturer.	Trade Name.	Dealer and Locality.
Cleveland Dryer Co., Cleveland, O.	Buckeye Ammoniated Bone Superphosphate	M. Wolverton, Blissfield
Cleveland Dryer Co., Cleveland, O.	Ammoniated Dissolved Bone	E. W. Spencer, Petersburgh
Cleveland Dryer Co., Cleveland, O.	3 Ex. XXX	Jesse Rogers, Lenawee Junct'n
Great Eastern Fertilizer Co., Rutland, Vt.	Tobacco and Hop Fertilizer	E. A. Pomeroy & Son, Jonesville
Great Eastern Fertilizer Co., Rutland, Vt.	Corn and Potato Fertilizer	E. A. Pomeroy & Son, Jonesville
Great Eastern Fertilizer Co., Rutland, Vt.	*Grape and Small Fruit Fertilizer	E. A. Pomeroy & Son, Jonesville
The Jarecki Chemical Co., Sandusky, O.	Lake Erie Fish Guano	Manufacturer
The Jarecki Chemical Co., Sandusky, O.	C. O. D. Phosphate	Manufacturer
The Jarecki Chemical Co., Sandusky, O.	Fish and Potash Tobacco and Potato Food	Manufacturer
Milsom Rendering and Fertilizer Co., E. Buffalo, N. Y.	Wheat, Oats and Barley Phosphate	Manufacturer
Milsom Rendering and Fertilizer Co., E. Buffalo, N. Y.	Buffalo Fertilizer	Manufacturer

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in Michigan for 1894.—CONCLUDED.

	Available Nitrogen.	Phosphoric Acid.			Potash Soluble in H_2O.	
	Estimated as NH^3.	Available P_2O_5.	Insoluble P_2O_5.	Total P_2O_5.	Estimated as K_2O.	Estimated as K_2SO_4.
Claimed	3 to 4	9 to 10	----------	11 to 12	1 to 2	----------
Found	2.07	11.42	3.33	14.75	.12	.26
Claimed	1.5 to 2.5	10 to 12	----------	15 to 18	----------	----------
Found	2.38	11.91	3.13	15.04	----------	----------
Claimed	----------	13 to 15	2	15 to 17	----------	----------
Found	----------	13.54	2.14	15.68	.05	.09
Claimed	----------	----------	----------	----------	----------	----------
Found	2.53	8.60	.51	9.11	6.07	11.17
Claimed	----------	----------	----------	----------	----------	----------
Found	2.07	8.00	.51	8.51	7.94	14.63
Claimed	----------	----------	----------	----------	----------	----------
Found	2.16	8.53	.52	9.05	6.46	11.95
Claimed	2.5 to 3	10 to 12	2 to 3	13 to 14	1 to 2	----------
Found	2.64	11.68	1.21	12.89	2.45	4.53
Claimed	----------	14 to 15	1	15 to 16	----------	----------
Found	----------	15.47	1.11	16.58	----------	----------
Claimed	2 to 3	6 to 7	1	7 to 8	3.5 to 4	----------
Found	2.72	10.80	1.50	11.30	2.22	4.10
Claimed	1.5 to 4	9 to 10	1 to 3	10 to 13	2 to 3	3.70 to 5.55
Found	1.70	7.44	4.52	11.96	4.36	8.06
Claimed	2.25 to 4	9 to 12	1 to 3	10 to 15	1.5 to 2.5	2.78 to 4.63
Found	2.41	7.67	3.31	10.98	1.60	2.96

Cameronian.	Jones Seedling.	No. 18 (Little).
Cheyenne.	Katie.	No. 42 (Little).
Clark's Seedling.	Magnate.	No. 2 (J. S.).
Dutter.	Mystic.	Odessa.
Glenfield.	Neptune.	Ohio Monarch.
Harmon.	No. 3 (Allen).	Primate.
Hattie Jones.	No. 3 (Feicht).	Southard.
Hermit.	No. 6 (Cameron).	Surprise.
Iowa Beauty.	No. 13 (Cameron).	Westlawn.

GROUP IV.

Varieties having little or no merit:

California.	E. P. Roe.	Nigger.
Dayton.	Estelle.	No. 1 (Engle).
Dr. Moraire.	Hyslop.	No. 31 (Haynes).

The strawberries have been under the care of my assistant, Mr. H. P. Gladden, who has carefully noted the behavior of the plants and prepared the material for this bulletin.

L. R. TAFT

AGRICULTURAL COLLEGE, MICH., *August 10, 1893.*

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